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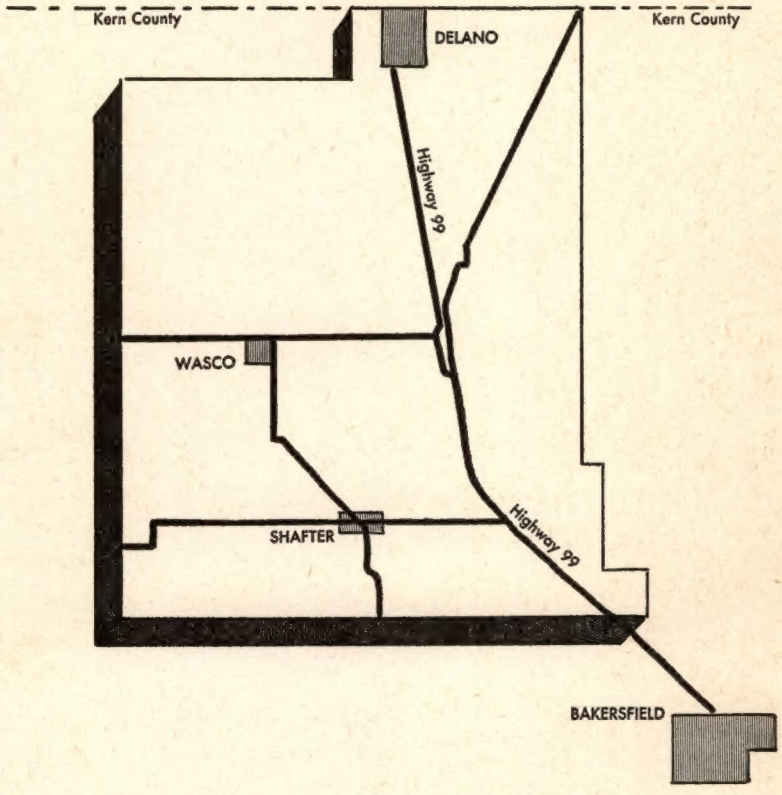
NORTHERN KERN COUNTY COTTON-POTATO FARMS



No. 1
OF A SERIES

ORGANIZATION, INPUTS and COSTS

CHESTER O. McCORKLE, JR.

TRIMBLE R. HEDGES

CALIFORNIA AGRICULTURAL EXPERIMENT STATION
GIANNINI FOUNDATION OF AGRICULTURAL ECONOMICS

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NORTHERN KERN COUNTY COTTON-POTATO FARMS

1. Organization, Inputs, and Costs[1/]

Chester O. McCorkle, Jr.[2/]
and
Trimble R. Hedges[3/]

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Two-thirds of the soils in the area studied are well suited for cotton and general farming. Sandy loams of the Hesperia and Hanford series predominate but significant areas of the Delano series are present. The long warm growing season and available water for irrigation make the area suitable for a wide variety of crops.

Organizational data from 405 farms of all sizes indicated that the largest number of farms cluster around the 80 and 160 acre units, although these farms accounted for less than 24 per cent of the total cropland farmed. Cotton and potatoes occupied over 75 per cent of the cropland regardless of size of farm.

A random sample of 40 farms in the 80 and 160 acre size groups provided detailed organizational and operational data from which inputs and practices could be computed. More variation was found to exist in

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Organization, Inputs, and Costs for Cotton-Potato Farms in Northern Kern County[1]

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Organizational data from 105 farms of all sizes indicated that the largest number of farms cluster around the 80 and 160 acre units, although these farms accounted for less than 2% per cent of the total cropland farmed. Cotton and potatoes occupied over 75 per cent of the cropland regardless of size of farm.

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equipment and timing of operations than in practices. Inputs and practices were very similar for farms of approximately equal size and organization, but changed significantly with size.

The input data from the farms sampled were analyzed using 1949 prices. The variations in physical inputs and practices then were reflected first, in operating costs for farm equipment and pumping plants and, in turn, in per unit costs of production. In general, the cost per hour of operation for equipment and the cost per acre foot of water pumped varied inversely with the size of farm. This relationship reflects differences in annual use made of these resources and, therefore, in overhead costs. Thus, considering farms of comparable organization, the cost of pumping water on an 80 acre farm was $7.83 per acre foot as compared with $6.74 on a 160 acre farm and $5.77 on a 320 acre farm. Organizational changes were also reflected in costs. Any change which brought about nearer optimum use of any given piece of equipment tended to reduce the per unit operating cost for that equipment.

Per unit production costs for cotton and potatoes on the three farm sizes studied showed a decline in cotton costs from nearly $111 per bale on the 80 acre farm to $103 on the 320 acre farm. This reduction is attributed to better use of farm equipment and irrigation facilities. The influence of organization is not entirely removed in these data and shifts in cost components with changes in scale and organization tend to obscure important changes by keeping total costs nearly constant. Other sets of price-cost assumptions would also tend to yield quite different production costs. These costs are merely guides because costs of production are different on every farm and on every field of any given farm. Therefore, the information presented is considered to be typical but not the cost of production for cotton or potatoes. It does show the directional changes to be expected in per unit costs as farm size and organization change.

Physical Factors Affecting Organization, Practices and Inputs on Cotton-Potato Farms

For the past four years farm management research in the Giannini Foundation has been oriented primarily toward compiling basic data on production inputs, practices, and costs in important agricultural areas of California. Reports of investigations in the Sacramento Valley rice area and the truck farming regions of the Salinas and Santa Maria Valleys are at various stages of completion. The third study in this series was conducted in the Northern Kern County cotton-potato area, the results of which are reported in this and subsequent publications.

The purpose of this report is to provide individual farmers, extension workers, rural appraisers, businessmen and other interested persons and agencies with facts about the farming units commonly found in the Shafter-Wasco-Delano-McFarland area. This is the first of a series of reports on agricultural production in this area. Attention is focused principally on the purely physical characteristics and relationships, although production costs for cotton and potatoes on various sizes of farms are presented. The strictly economic problems of income, net returns and comparative earnings are left to subsequent reports.

Five specific topics are discussed in this report: (1) the size and organizational characteristics of cotton-potato farms; (2) the natural factors which bear on agricultural production, both physical and biological; (3) the nature of physical input-output relationships for selected enterprises and sizes of farms; (4) the nature of interrelationships between enterprises, how they arise, and their effects on the production process; and (5) specific production costs.

A brief discussion of sources of data, method of collection, and technique of analysis is pertinent at this point to focus attention on the advantages and limitations of the material presented. The early studies in this series are being directed to production areas which are relatively homogeneous in themselves with respect to soil, climate, topography, and farm organization. For this reason, the Northern Kern County cotton-potato area was one to receive early attention.

Two preliminary surveys of the general area were made, the first in late 1949 and early 1950 and the second in April of 1950. The area to be studied was delineated on the basis of data obtained and the next step

Physical Factors Affecting Organization,
Practices and Income on Cotton-Potato Farms

was to define the sample area precisely and decide upon sampling procedure. Available records in the Kern County office of the Production and Marketing Administration were studied to obtain broad information covering all farms in the area and to identify the population for the sample. Out of a total of 405 farms, defined in terms of operational units rather than separate tracts, a sample of forty farms was selected for individual study. The sampling technique employed was designed to yield random and representative cases.4/ The information presented in the section on size and organizational characteristics resulted from analyzing the total of 405 farms. The data from the sample farms provided the basis for the material contained in the latter parts of this report.

Organizational data for each farm in the sampled group of 40 was recorded on a questionnaire, with the help of the farm operator, by a trained enumerator. Information taken included cropping systems, rotations, acreages, yields, irrigation facilities, available farm equipment and power units, available labor resources, plus nature and sequence of production techniques for each enterprise on the farm. The latter included performance rates for all equipment and inputs of all labor and materials through the entire growing and harvesting season. The system of sampling can be expected to result in random selection of typical producers. The information obtained and reported is, therefore, considered representative of the conditions under which typical producers were operating when surveyed. This is not to say that all producers are faced with the same production problems, that they are all following the same pattern of production, or that the resources at their disposal are identical. Variations in resources and practices were numerous. This report presents typical organizational

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4/ The mechanics of the sample deserve brief note. On the basis of crop acres, farms were segregated into two groups, one composed of farms with from 60 to 90 acres and the other from 140 to 170 acres. These two groups were selected because of the apparent clustering of farms around these two sizes. A restricted random sample (random sampling without replacement) of 30 farms was drawn from each, 10 being alternates in each group to serve as substitutes when an operation changed structure between the time of examination by P. & M.A. and this survey, or when after two recalls the operator could not be reached. The significant feature in sampling for the data desired was randomness and representativeness since typical operational patterns were desired. (The more technical biased or unbiased estimates of particular parameters, with minimum variances attaching to these estimates, served no purpose in this study.)

and operating data for types of farms frequently occurring in the area and examines their characteristics. It is believed the resulting data and analysis will be useful as norms in studying farm problems.

Natural Factors Affecting Agricultural Production.--The natural determinants, as opposed to economic determinants, can be segregated into two groups--physical and biological. The principal physical factors are topography, soil and climate while biological factors include weeds, insects and diseases. It is difficult to form categories which facilitate independent treatment since interrelationships exist. For example, climate, soil and water conditions have a decisive effect on the presence, prevalence, and destructiveness of biological species. Some system of separation is necessary, however, inasmuch as all such factors cannot be discussed simultaneously. Topography, soil and climate, therefore, are considered in this and the biological factors in the following section.

Physical Determinants

The topography in the vicinity of Northern Kern County is considered very favorable for irrigated agriculture; the movement of soil to facilitate irrigation is usually limited to establishing adequate "fall." The general slope is northwest toward the valley floor with a decline in elevation of 10 to 13 feet per mile.

The soils are characteristic of those found in a semiarid region with hot, dry summers and mild winters, the entire annual rainfall coming during the winter months. The typical soils are light colored in the surface layers, generally low in organic matter content, and grayish-brown, calcareous and more or less compact in the subsoils. There is an abundance of plant nutrients other than nitrogen,but the heavier soils tend to contain excessive amounts of neutral and alkaline salts. About one-third of the soils are well suited to cotton and potatoes and another sixth fairly satisfactory (Table 1).

The climatic characteristics of Northern Kern County are similar to the Mediterranean-type--hot, dry summers and mild, moist winters found throughout the southern San Joaquin Valley of California. The Coast Range, the Sierra-Nevada, and Tehachapi Mountains form isolating walls on three sides, reducing the influence of outside climatic conditions to a minimum. Weather records reveal a pattern of hot summer weather, with

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TABLE 1

Classification of Soil Series Based on Suitability for Agricultural Use

Class I		Class II		Class III		Class IV		Total
Soils very well suited to fruit growing and truck farming.		Soils generally well suited for cotton and general farming, and less desirable for truck farming.		Soils less desirable for cotton growing and general farming.		Soils generally suitable only for grazing.		
Series	Per cent of total area	Series	Per cent of total area	Series	Per cent of total area	Series	Per cent of total area	
Hesperia	26.1	Cajon	2.0	Traver	12.8	Pond	9.1	
Hanford	4.9	Foster	.2	Chino	1.6	Fresno	1.9	
Greenfield	1.5	Adelanto	2.2			Hacienda	a/	
		Delano	20.1			Waukena	.1	
		Exeter	6.3			Milham	5.6	
		San Joaquin	2.2			Cuyama	.7	
		Madera	2.3			Tujunga	.2	
		Chualar	a/					
Total	32.5	Total	35.3	Total	14.4	Total	17.6	99.9 b/

a/ Less than .05 per cent.

b/ Riverwash accounts for .1 per cent.

Source of data: U.S. Department of Agriculture, Soil Survey, The Wasco Area California, August 1942. Washington, D.C.

maximum average temperature exceeding 90 degrees, from May through September. The winter temperatures are mild, with only the months of December and January showing an average minimum temperature of less than 32 degrees Fahrenheit. The growing season in the Pasco area is comparatively long. Killing frosts have occurred as late in spring as April 29 and as early in fall as October 1, but the average date for the last killing frost is March 11 and for the first, November 16, giving on the average a 250-day growing season. A growing season greater than 274 days can be expected about one year in four, while the probability of one shorter than 225 days is approximately the same.

Rainfall plays a dual role in agricultural production. It supplies moisture necessary for plant growth and affects field operations during certain months of the year when such operations must be performed, if optimum planting schedules are to be observed. In the first role, rainfall is of secondary importance in this area since virtually all the moisture necessary for plant growth must be supplied by irrigation from underground sources (at the time of this study) in light of the small annual rainfall and its seasonal pattern. The average seasonal rainfall total based on fifty years records is 6.34 inches with a seasonal total exceeding ten inches in only 5 years and a seasonal rainfall of less than four inches in only 7 years of the fifty studied. Virtually all the rainfall is received between December 1 and March 30, with an occasional storm in late November or early April. Rainfall is of prime importance in its second role during the period that land preparation and planting of potatoes must be accomplished and cotton seedbeds prepared. Climatological factors, therefore, further define the farming systems and enterprises selected for the organizations.

Since all crops in the study area are grown under irrigation with the exception of a small quantity of dry farmed grain, the quantity and quality of irrigation water is of prime importance. Irrigation water comes from three sources: rainfall, nearby rivers and streams, and the underground reservoir. The relatively unimportant contribution of local rainfall has been mentioned. That taken from rivers and streams is of some small importance in early spring for flooding some natural pasture found in the area. Since these two sources are relatively insignificant, the underground supplies have been drawn on heavily, and the water table

has gradually declined. The only apparent solution to the latter problem appears to lie in the introduction of water from "The Central Valley Project." In general, the quality of well water is good but with deeper wells and "softer" waters, new problems of water penetration have been introduced.

Biological Determinants

Northern Kern County is affected by approximately fifty different species of weeds and grasses. Of particular concern to the farm operator are White Horse Nettle (Solanum elaeagnifolium), Lambs Quarters (Chenopodium album), Wild Morning Glory (Convolvulus arvensis), Puncture Vine (Tribulus terrestris), Russian Thistle (Solsola Koli), Nutgrass (Cyperus esculentus), Johnson Grass (Holcus halepensis), Bermuda Grass (Cynoden Dactylon), Water Grass (Echinochloa Crusgalli), and Sandbur Grass (Cenchrus panciflorus). These weeds and grasses, if uncontrolled, will encroach on farm land leading to heavy losses through reduced crop yields, increased cultivation and irrigation costs, and increased ultimate eradication costs. Weed and grass problems are particularly acute when mechanical cotton harvesting is contemplated and with crops like sugar beets and potatoes where cultivation must be stopped relatively early in the growing period. Only constant alertness for infestations, continual cultivation and spraying of fence lines and roadsides will bring weeds and grasses under control.

The incidence of insect damage to principal crops is widespread when adequate control measures are not taken. Lygus bugs in cotton and tuber moths in potatoes are the two most damaging insects in this region. While dusting each season will bring both under control, it is not accomplished without significant cost increases.

Verticillium Wilt, a soil-borne fungus disease, is the principal disease attacking cotton in the southern San Joaquin Valley. Rotation with small grains provides the most economical control at the present time. Potatoes are attacked primarily by two fungus diseases, Scab and Leak. With these diseases, care in cultural practices and rotation is the most effective means of preventing their spread.

Size and Organization Characteristics.--Though varying in size from two or three acres to four and five thousand acres per farm, the largest number of farms cluster around the 80 and 160 acre units (Table 2). Over

TABLE 2

Size Characteristics of 405 Cotton-Potato Farms in Northern Kern County, California, 1949

Total Farm Size (acres)	Number of Farms	Average Cropland per Farm (acres)
0 - 29	21	17.6
30 - 59	76	35.4
60 - 89	68	67.6
90 - 119	30	93.7
120 - 149	29	119.6
150 - 179	40	149.6
180 - 239	33	192.3
240 - 299	27	240.9
300 - 399	24	302.4
400 - 499	12	388.4
500 - 699	20	530.1
700 - 999	13	746.6
1,000 and over	12	1,594.5

Source of data: USDA Production and Marketing Administration, Bakersfield, from individual farm worksheet records.

65 per cent of the farms are less than 180 acres in size yet this group occupies only about 24 per cent of the total cropland farmed. On the other hand, the 12 largest farms occupy about the same percentage of the total cropland while representing less than 3 per cent of the total farms. Of those farms smaller than 180 acres, 25 per cent could be classified as 80 acre farms and 15 per cent as 160 acre farms. A total of 40 per cent of those less than 180 acres were either 80 or 160 acre units. In terms of the total number of farms, nearly 27 per cent fell into one of the two categories. These comparisons reveal the relative importance of these two size groups in terms of the number of farm operators. Much of the data to be presented in this report is based on these two size groups because of these facts.

Turning to a consideration of organizational characteristics, the acreage devoted to cotton and potatoes on farms of various sizes is pertinent. Data concerning the relationships between per acre yields and size are available for the same 405 farms.

The combination of cotton and potatoes in all size groups utilizes more than three-quarters of the cropland (Table 3). On farms of less than 60 acres over 90 per cent of the land is devoted to cotton and potatoes. It is not possible to add the percentages meaningfully on small farms, however, because the smaller operators in many cases devote all of their limited acreages to one crop or the other.

While cotton tends to maintain about the same relative position in the farm organization regardless of size of farm, potatoes do not appear to duplicate this pattern. As size of farm increases to approximately 160 acres, cotton and potatoes bear roughly a 2 to 1 relationship in terms of acreage devoted to each enterprise. As size increases beyond 160 acres, cotton continues to occupy approximately two-thirds of the cropland but the potato acreage does not exhibit the same pattern of proportionate increase. This indicates that enterprises other than potatoes and cotton tend to become more important as size increases. Other than physical and economic forces help establish this pattern. Physical and economic determinants such as equipment capacities, water use, conditions of contract operations, and labor requirements bear heavily on the extent to which any given enterprise is expanded. But, the various federal regulations with respect to planted acreage and history establishment exert strong pressures

TABLE 3

Organization Characteristics of 405 Cotton-Potato Farms
in Northern Kern County, California, 1949

Total Farm Size (Acres)	Cotton			Potatoes		
	Average Acreage per Farm Reporting	Per cent of Cropland	Average Yield per Acre (lbs. lint)	Average Acreage per Farm Reporting	Per cent of Cropland	Average Yield per Acre (lbs.)
0 - 29	10.1	57.4	832	8.1	46.0	376
30 - 59	21.6	61.0	851	15.1	42.6	377
60 - 89	44.5	65.8	780	20.5	30.3	359
90 - 119	53.8	57.4	748	28.8	30.7	394
120 - 149	75.1	62.8	757	35.0	29.3	365
150 - 179	107.0	71.5	696	30.3	20.2	360
180 - 239	132.8	69.1	721	54.1	18.1	364
240 - 299	162.2	67.3	649	58.8	24.4	341
300 - 399	197.1	65.2	670	86.5	28.6	353
400 - 499	301.2	77.5	722	62.4	16.1	393
500 - 699	340.6	64.3	653	166.6	31.4	349
700 - 999	397.8	53.3	656	184.5	24.7	360
1,000 and over	1,078.0	67.6	635	214.7	13.5	413

Source of data: USDA Production and Marketing Administration, Bakersfield, from individual farm worksheet records.

on individual producers to expand or contract the acreage and production of various crops from year to year. The importance of this outside influence should not be underestimated.

The gradual, though irregular, decline in yield per acre of cotton as farm size increases is significant. Two reasons exist for this decline. First, there may be some small decline associated with more extensive operations; however, the variation in yield from farm to farm in any given size range is such as to cast considerable doubt on the reliability of this explanation. The primary reason for this pattern is found in the relationship between size of farm and location in the study area. Yields tend to be higher in the farming areas longest established and in these areas there are a large number of small farms. In the newer and typically outlying or fringe cotton areas the acreages are larger and yields smaller. Therefore, some caution should be exercised in the interpretation of these yield data.

With respect to potato yields, a different set of institutional factors exists to aid in explaining the apparent yield-size relationships. No significant change in potato yields in association with farm size is evident until the large farms are studied. For farms of 1,000 acres or more, potato yields tend to increase. The apparent reason is the tendency toward vertical integration in potato production by larger producers. These producers not only specialize in the growing of potatoes but, also usually own and operate a packing shed. In a few cases their operations extend to the marketing phase. When this is true, the entire production and marketing process can be planned and coordinated, thus insuring proper timing of all operations. Potatoes can be dug at the optimum time and all subsequent operations can be performed with no delays. Such an arrangement insures a better end-product with less loss and delay. The locational factor no longer provides an explanation for variation in the yield of potatoes. Their lesser tolerance of adverse soil conditions, particularly salt concentrations has brought about the necessary adjustment in production to the favorable soils.

Input-Output Relationships for Selected Enterprises.--With the natural determinants of production and the general level of advancement in production techniques known for the study, it is possible to establish a set of production schedules, commonly referred to as physical input-output relationships. It is not feasible to include all variations in production

practices for each enterprise. It is essential, however, to include those variations arising from differences in scale of operations and organization. A close approximation of the effects of scale in the production technique associated with a given enterprise can be made by holding all other influences constant, although practical difficulties may make precise measurement impractical.

Based on the information obtained in the field, five typical but synthetic farms, two of 80 acres, two of 160 acres, and one of 320 acres were developed. The cropping pattern and acreage ratios were approximately constant for three of the farms, one in each size group, to permit the study of variations associated with scale. The level of managerial ability relative to size was assumed to be equal in each case. Then, for each size, the typical equipment, power units, irrigation systems, labor supply, etc., were synthesized in order to show the effects of scale on physical inputs, and on cost per unit of input and output. The basic physical resources and the corresponding investment represented for these five farms are presented in Appendix Tables 1 through 5. Having the resources available to each operator specified, it is then possible to establish a synthetic "standard" of typical inputs for a given output for each enterprise on each size of farm. These inputs and outputs are typical in the sense that they represent the modal or most prevalent production pattern; that is, in operations performed, timing and method of performing these operations, rates of performance, quantities of inputs, and yields obtained.

Standards of inputs and outputs and calendars of operations have been prepared for eleven of the most important crops, in terms of acreage, for the area studied (Appendix Tables 6 through 16). The eleven crops examined are: cotton, potatoes, alfalfa, milo, barley, sugar beets, onions, dry beans, safflower, castor beans, and field corn. For this report, the 160 acre farm was considered the basic unit and a standard for each of the eleven enterprises was established for this size. In addition, standards for cotton, potatoes, alfalfa, and milo typical of the 80 acre farming unit were prepared (Appendix Tables 17 through 20). The principal difference between the 160 and the 80 acre farms is in the available power units, which in turn is reflected in the performance rates.

The information contained in indicated tables is largely self-explanatory, but a brief summary of their organization and content may be helpful. In

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above enterprises were established for this size. In addition, standard
for cotton, potatoes, alfalfa, and milo typical of the 40 acre farming unit
were prepared (Appendix Tables 17 through 21). The principal difference
between the 160 and the 80 acre farms is in the available power units, which
in turn is reflected in the performance ratios.

The information contained in indicated tables is largely self-explanatory,
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all cases, these standards are organized on a per acre basis for convenience in analyzing and comparing various enterprises. The per acre yield on which each standard of inputs is calculated appears in the title of the table. The period of time given beside each operation in the column labeled "Dates" refers to the period during the season when the particular operation is typically performed. Once the planting date is established the operational dates become more fixed, since the optimum time lapse between such operations as irrigating and cultivating is then rather narrowly defined.

The identifying letters used for the tractors require brief explanation. In order to summarize the raw data obtained on the tractors operated by each producer, a system of letters and numbers was devised to include all sizes and makes of tractors. Only three sizes are used in these tables, W-2, W-3, and DT-3. A W-2 tractor is a wheel tractor with a rated drawbar horsepower of between 15 and 20 horsepower. A W-3 tractor is likewise a wheel tractor but with a rated horsepower of between 21 and 27 horsepower. The DT-3 is a diesel track layer with rated drawbar horsepower between 19 and 23 horsepower.[5/]

Where contract operations are mentioned, reference is made to the practice of hiring these operations done either by commercial contractors or by other farmers owning the necessary equipment.[6/] Performance rates and physical requirements reported in these tables are based on sample data obtained from farmers interviewed. Sufficient numbers of farmers were using the same sizes of tractors and equipment to provide fairly large samples for computation of these rates.[7/] In the few cases where insufficient evidence was available, data from other areas where similar conditions prevail were used to verify or strengthen the results obtained.

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5/ The rated drawbar horsepowers were taken from results of the Nebraska tractor tests where models had been tested. In cases where models were not yet reported on in the results of these tests, data furnished by the manufacturers had to be substituted.

6/ The rates charged for various jobs by contractors are shown in subsequent tables.

7/ In all instances performance rates were taken for given fields of known acreage and the rates reduced to a per acre basis. This technique greatly reduces the margin of error in per acre figures and permits the quoting of performance rates in fractions of hours with greater accuracy than when the data are obtained on a per acre basis in the field.

all cases, these standards are organized on a per-zone basis for convenience in analyzing and comparing various enterprises. The per zone yield or unit each standard of income is calculated assuming it the title of the table. The period of time given beside each operation in the column "Period reference to the period during the season when the particular operation is typically performed. Once the planting date is established the approximate dates during more fully, since the optimum time lapse between each operation is interdependent and deliverying is that another man-mile allowed.

In [illegible] factors used for the various major [illegible] In order to compare the new data obtained on the [illegible] used in previous years, a system of letters and numbers was devised to include all three [illegible] number of crossbred. Only three sires are used in the [illegible], B-1, [illegible] B-2, B-3. A B-1 sire is a Wheel Breeder with a rating of between 3[illegible] and 4[illegible] Breeder. A B-3 breeder is likewise a wheel breeder but with a rated horsepower of between 2[illegible] and 2[illegible] horsepower. The B-3 is a diesel track layer with rated drawbar horsepower between 3[illegible] and 4[illegible] horsepower.[1/]

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[illegible] These rates closely corresponded with [illegible] of the Agricultural [illegible] were readily available. In a few cases where data were not [illegible] in the results of these tests, data furnished by the [illegible] were utilized.

[illegible] The ratios observed for various jobs by particulars are shown in [illegible] tables.

[illegible] In all instances performance ratios were taken from given kinds of [illegible] readily reduces the margin of error in set down literature and [illegible] the [illegible] when the data are obtained on a per acre basis in the field.

A comparison of the labor, water, and tractor requirements per acre for the several enterprises indicates which are heavy consumers of water, labor, and tractor (and machinery) resources. This comparison is made for the 160 acre farm for those enterprises for which standards have been constructed (Table 4). Cotton draws relatively heavily on labor resources, particularly during the picking season if the cotton is hand picked. Likewise, the cotton enterprise requires the most tractor hours per acre because of the large number of cultivations carried out. On this point, it should be explained that the data on tractor inputs may be misleading in that crops such as onions may require extensive cultivation but spraying has been developed to replace much of the cultivation. The wide variation in water consumption by various enterprises is also to be noted. Alfalfa and sugar beets are the heavy water consumers, principally because of their long growing season, while barley and beans require relatively little water.

Enterprise Interrelationships.--The physical requirements for producing given crops and the timing of the operations for each enterprise have been presented. It is important to examine the manner in which these enterprises relate one to the other. A knowledge of such relationships is essential when planning the farm organization in order to avoid conflicts in the use of various equipment, labor, and water resources and yet utilize these same resources to the fullest extent.

Three types of interrelationships deserve consideration--competitive, supplementary, and complementary. Enterprises which compete for or conflict in the use of resources of the farmer are said to be competing. Those which require the same resources but at different (and non-conflicting) times may be referred to as supplementary or noncompeting enterprises. If enterprises possess features which make them valuable in that they contribute to the productiveness of some other enterprise, they are known as complementary enterprises. A given enterprise may bear all three relationships to another or to several other enterprises concurrently, depending on which production resource is in question.

A study of these relationships helps further to understand why particular enterprises come to be associated in farm organizations. For example, cotton and potatoes compete for only land and even here the competition is not at all precise. Some producers are experimenting with

TABLE 4

Comparative Physical Inputs Per Acre of Labor, Tractor Power, and Water for Selected Crops on 160-Acre Farm Units in the Northern Kern County Study Area

Crops	Labor inputs a/	Tractor power inputs	Water inputs
	(man-hours)	(tractor hours)	(acre-inches)
Alfalfa	10.3	4.6	63.4
Beans	17.5	6.5	22.8
Barley	3.8	1.4	19.2
Castor beans	13.1	3.5	32.0
Cotton	115.6	7.9	38.4
Field corn	14.2	3.7	43.2
Milo	13.0	4.2	27.6
Onions	191.1	5.4	32.0
Potatoes	56.3	4.9	30.0
Safflower	13.0	5.3	30.0
Sugar beets	37.7	7.1	72.0

a/ Including hand weeding, hoeing, chopping, thinning, and hand harvest labor, usually contracted for on a piece-work basis. Does not include labor which is used with a mechanized contract operation such as a potato digger, hay baler, barley or bean combine, etc.

Source of data: Tables of Standards of Inputs and Costs for individual enterprises.

double cropping of cotton after early potatoes but as yet this practice is not generally recommended. Usually, it delays the cotton planting beyond the recommended date. The excellent use made of such important resources as water and irrigation labor, motive power and equipment when both cotton and potatoes are in the farm organization serves to illustrate the supplementary relationship. In this area, a complementary relationship takes one or more of three forms. It may appear through a more complete utilization of the soil nutrients as with alfalfa and cotton in a rotation. Or it may occur when fertilizers applied to one crop are not fully utilized and are beneficial to the following crop. Milo following potatoes as a double crop illustrates this relationship. Almost all enterprises tend to be complementary in the sense that they produce a residue which, when turned under, adds to the humus content of the soil. The suppression of weeds through rotation might also be added as a complementary relationship. In other farming areas complementary relationships assume greater importance particularly where animal residues provide fertilizer for crops produced on the farm.

From the timing of operations, the physical resources used, and the farm organization in question, it is possible to establish the many enterprise relationships for any given farm. Such information, and an effective understanding of its implications, is vital to the economic success of any farming operation.

Economic Determinants

Prices and Cost Rates.--The following discussion of prices and costs is required to introduce money values which, when combined with physical input data already developed, will yield specific costs of production for selected crops. "Prices", as used here, refer to prices paid by farmers for materials and services. Cost rates are annual costs for the use of equipment such as tractors and underground irrigation systems that are not consumed in one production year. Price information was assembled from buyers and sellers of the materials and services in question. These sources included labor and job contractors, farm supply houses, fuel and oil distributors, power companies, agricultural chemical companies, and farmers. Cost rates were computed from basic data obtained on the farms and from equipment dealers, bankers, pump companies, well drillers,

irrigation pipe manufacturers and installing organizations.

Prices of Materials and Services.--Pertinent materials and services prices as of 1949 for the local area studied have been classified into five groups: labor costs, contract operations costs, materials costs, power costs, and miscellaneous costs. A brief discussion of each group and a table presenting the prices and costs is presented below. Farm products prices are not given here since the evaluation of earnings will be considered in subsequent publications.

Labor costs.--Two problems arose in determining rates of pay for specific tasks performed by farm laborers: (1) most hired laborers on farms performed more than one task, and (2) methods of payment varied so widely as to make interfarm comparisons difficult. These problems were partly overcome by (a) reducing items such as perquisites to a monetary base, (b) adjusting bonuses and monthly salaries to per-hour rates, and (c) analyzing total salary payments in terms of time spent at various jobs for which the rates of pay vary, and determining what per hour payments were equivalent to the total payment. The usual basis of payment for each of the common tasks together with the rate of pay then were summarized (Appendix Table 21).

Contract Operations Costs.--Farms too small to make economic utilization of larger pieces of equipment within the confines of the farm commonly contract the services of such equipment. Charges for the services of this equipment do not vary widely except where field or crop conditions are abnormal. Farms of the size considered in this report usually contract one or more operations in most enterprises. An exception is the producer who contracts outside work with his equipment in addition to using it in his own farming operation. The charges and the basis for these service charges also are presented by enterprises and operations (Appendix Table 22). These expenses bulk large in the total cash outlay for operators of smaller farms but it is more economical for them to contract for the work in most cases than to bear the investment expenses of owning and operating machinery used at less than average capacity.

Materials Costs.--Included under materials are seed, dusts and sprays, fertilizers and soil conditioners, and fuels and lubricants (Appendix Table 23). Prices of these items to producers tend to be competitive but it should be noted that both cash and quantity discounts are available

on many items. Such discounts, particularly the quantity discounts, become important sources of savings to larger producers.8/

Power Costs.--When ground water is virtually the only source for irrigation, pumping water to the surface represents a sizeable expenditure in producing all irrigated crops. Over 90 per cent of the pumping units are driven by electric motors of sizes varying from 10 to 100 horsepower. The electric power to operate these motors is supplied by The Pacific Gas and Electric Company or Southern California Edison, at rates varying according to motor rating and kilowatts used (Appendix Table 24).

Miscellaneous Costs.--Included under miscellaneous costs which must be borne by the various enterprises in the farm organization are land taxes, workmen's compensation insurance, interest on investment in land, and, for perennial crops, depreciation on the planting.

Land tax rates for the area, based on a study of the records and information from the County Assessor, were set at $6.25 per year per acre though some variation existed. Differences in school rates rather than land classes were largely responsible for the variation. Workmen's compensation insurance rates were $1.10 per $100 of payroll at the time this study was conducted. The establishment of an interest charge for investment in land involved two decisions: (1) what value to place on the land and (2) what interest rate to use in computing the annual interest charge. While recent sales of agricultural properties indicate values as high as $500 per acre and more, the figure established for the computation of interest was $300. This is considered to be more in line with long-term land values. An interest rate of 5 per cent was selected on the basis of alternative uses for the equivalent money.

Charges for depreciation of stand in computing costs of producing perennial crops assumes considerable importance when the crop is one of two or three years duration and/or when the initial expense of establishing

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8/ Cash discounts vary from 1 to 5 per cent depending on the material. Quantity discounts are particularly important in fuels and lubricants. For example, gasoline sold for $ .018 less per gallon in quantities of 550 gallons or greater. The saving on diesel fuel in quantities this large amounted to $ .01 per gallon. Grease sold for $ .01 per pound less when purchased in 110 lb. containers. These savings are reflected in the cost tables computed in later sections of this report.

important purpose of money is to keep products.

Those [illegible] without ground water is virtually the only source for [illegible], ranging upward to one billion represents a sizable amount[illegible] is producing all irrigated crops. Over 90 per cent of the running units are driven by electric motors of sizes varying from 10 to 100 horsepower. The electric power to operate these motors is supplied by the Pacific Gas according to motor rating and kilowatts used (Appendix Table 31).

[illegible] be undone by the various subsidies in the farm organization and local taxpayer's compensation insurance, interest on investment in land, etc., for

Land tax rates for the area, based on a study of the records and information from the county Assessor, were set at [illegible] per year per acre compensation insurance rates were $1.40 per $100 of payroll at the time this study was conducted. The substitution of an interest charge for investment in land involved two decisions: (1) what value to place on the land and (2) what interest rate to use in computing the annual interest charge. While recent sales of agricultural properties indicate values as [illegible] per acre and more, the figure established for the county's interest was $300. This is considered to be more in line with long-term land values. An interest rate of 5 per cent was selected on the basis of alternative uses for the equivalent money.

Charges for depreciation of stand in computation costs of producing perennial crops assume considerable importance when the crop is one of two or three years duration and/or when the initial expense of establishing

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1/ Crop discounts vary from 1 to 5 per cent depending on the material, quality desired and the particularly important in fruit and [illegible] per pound, ginning cost to the grower is [illegible] per pound, [illegible] per pound of [illegible]. The buying of diesel fuel in quantities of [illegible] amounted to $ .07 per gallon. Cheap gold for $ .01 per pound, [illegible] in this most trucks consumed in [illegible] sections of this report.

the planting, as with tree crops, may be large. In this study, the problem was one of establishing an alfalfa stand which normally would be expected to be removed after three years of production. In keeping with this production period, the cost of establishing the alfalfa stand to the time of the first cutting was calculated and prorated over three years. The usual methods of establishing the stand in this area was used, together with the cost items as outlined above. The initial cost of obtaining the stand was calculated to be $39.14 per acre. The depreciation charge would therefore be $13.05 per acre per year, assuming a three-year productive life.

Overhead Costs

Four sources of overhead costs are to be recognized in operating an irrigated farm of the type found in this area: those incurred in operating (1) tractors, (2) farm implements, (3) farm pumping plants, and (4) underground irrigation systems. These costs have been computed on an annual basis for typical units found on the farms studied (Appendix Tables 25 through 28). The overhead cost for the irrigation system on a 320 acre farm was omitted since it was found to be typically twice that required on a 160 acre farm.

The same general method was used in establishing overhead cost data for the four sets of resources. First-costs were obtained by applying dealer-supplied prices to typical equipment found on the sample farms. Equipment dealers indicated that a salvage value of 15 per cent is normal for tractors and farm implements. Average values were established by adding the salvage value to the first cost and dividing the total by two. Where no salvage was present, as for portions of the well and pump, the first cost was divided by two. Depreciation was calculated by the straight-line method on the difference between the first cost and the salvage value. A reasonable life for each piece of equipment was established by examining present equipment age and condition and consultation with dealers. In calculating the interest charges, 5 per cent was again used as the rate. A study of tax and insurance charges on farm tractors and equipment indicated that a charge of 1 per cent per year of the original cost approximated the total of these two charges. Data on taxes and insurance on wells, pumps, and underground systems were obtained from the County Tax Office and from agents. The shelter charge for tractors was computed according to space occupied and the cost incurred

in erecting and maintaining such shelter.

The influence of arbitrary elements entering the calculations of overhead costs must not be minimized. Appropriate lengths of life and annual cost rates are difficult if not impossible to establish. The interactions between annual use, years of life, maintenance and repair policies, and appropriate depreciation rates vary significantly from farm to farm. Furthermore, the relative importance given to obsolescence and depreciation differs widely from operator to operator. Finally, the researcher is not in a position to assess the individual farm operator's financial position nor his appraisal of the future. Therefore, any estimate of the farmer's view with respect to risk and uncertainty is strictly arbitrary. For these reasons, any cost estimates based on the arbitrary assumptions which must be made with respect to the above conditions must be viewed as static long run costs subject to such modification as might arise from any shift in the assumed data on which the calculations are based.

Operating Costs for Power Units, Machinery, and Pumping Plants.--Per hour operating costs for tractors, equipment, and pumping plants on each of the five farms have been computed for later analysis (Tables 5-7). Operating costs in these tables are composed of overhead and variable costs, the latter directly reflecting variation in annual use. Overhead costs were developed in the previous section. Methods used in calculating variable expenses--fuel, oil, grease, repairs, and servicing--are outlined below.

Annual fuel, oil, and other oil and grease bills for tractors were obtained by multiplying the annual use by the consumption per time unit and applying the prices contained in previous tables.[9/] An arbitrary method of estimating repairs for tractors has been used. The results obtained by this method were supported by the experiences of producers in the area as evidenced

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9/ A study of fuel consumption on tractors operating in this area yielded the following fuel consumption data:

W-2, 17.5 gallons of gasoline per 9 hours of running time for an average load.

W-3, 25.0 gallons of gasoline per 9 hours of running time for an average load.

DT-3, 18.0 gallons of diesel fuel per 9 hours of running time for an average load.

Oil consumption, including a prorated share for changes, was found to approximate 1.5 gallons per 9 hour day for the DT-3, .9 gallon for the W-3, and .8 gallon for the W-2. Other grease and oil consumption was estimated at ½ lb. per 9 hour day.

TABLE 5
Comparative Costs of Operating Farm Tractors on 80, 160, and 320 Acre Farms with Selected Organizations

Farm Tractors and Cost Items	I (160 Acres)			II (160 Acres)			III (80 Acres)			IV (80 Acres)			V (320 Acres)		
	Total Cost	Hours operated	Cost per hour operated	Total Cost	Hours operated	Cost per hour operated	Total Cost	Hours operated	Cost per hour operated	Total Cost	Hours operated	Cost per hour operated	Total Cost	Hours operated	Cost per hour operated
W-2															
Overhead a/				$216.60			$216.60						$216.60		
Fuel				205.13			210.83						311.58		
Cylinder Oil				42.77			43.96						64.96		
Other Oil and Grease				5.05			5.19						7.67		
Repairs				31.19			31.19						31.69		
Servicing				13.46			13.84						20.45		
Total				$514.20	712.8	$ .72	$521.61	732.6	$ .71				$652.95	1082.7	$ .60
W-3															
Overhead a/	$362.73									$362.73			$362.73		
Fuel	234.72									270.58			269.36		
Cylinder Oil	34.99									40.34			44.22		
Other Oil and Grease	3.82									4.40			4.64		
Repairs	74.70									74.70			52.29		
Servicing	9.79									11.29			12.38		
Total	$720.75	518.4	$1.39							$764.04	597.6	$1.28	$745.62	655.2	$1.14
DT-3															
Overhead a/				$435.40			$435.40						$435.40		
Fuel				59.99			42.34						42.90		
Cylinder Oil				33.41			23.59						23.90		
Other Oil and Grease				2.10			1.49						1.50		
Repairs				62.79			62.79						62.79		
Servicing				8.25			5.83						5.90		
Total				$601.94	297.0	$2.03	$571.44	209.7	$2.72				$572.39	212.4	$2.69

a/ Depreciation, interest, taxes, insurance, and shelter.

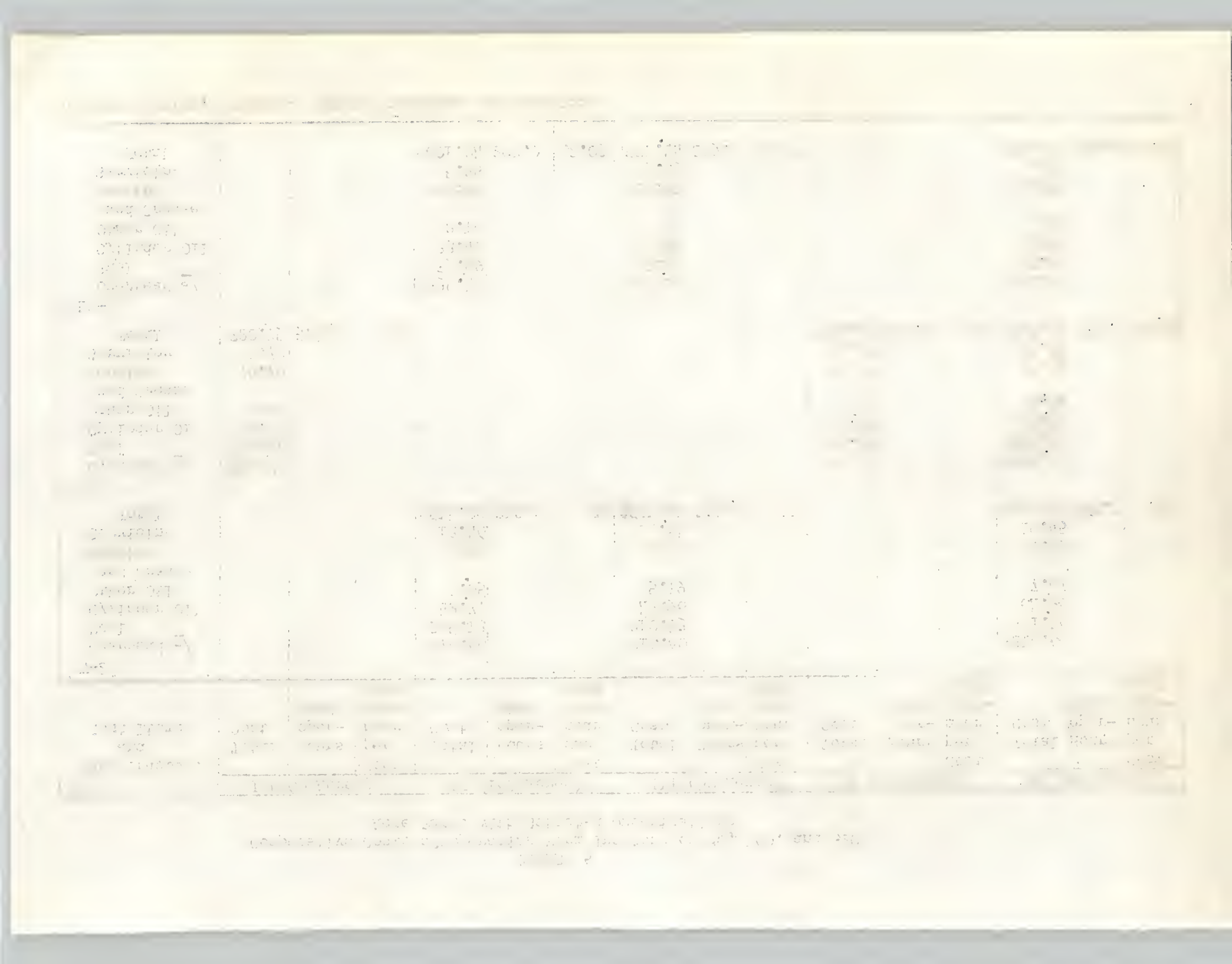

TABLE 6

Comparative Costs of Operating Farm Equipment on 80, 160 and 320 Acre Farms with Selected Organizations

Equipment	Farms									
	I (160 Acres)		II (160 Acres)		III (80 Acres)		IV (80 Acres)		V (320 Acres)	
	Annual Cost	Per Hour Operated	Annual Cost	Per Hour Operated	Annual Cost	Per Hour Operated	Annual Cost	Per Hour Operated	Annual Cost	Per Hour Operated
8' Chisel	$ 37.18	$ .56	$ 38.18	$ .42					$ 40.73	$ .27
10' Cultipacker	27.36	1.27	28.72	1.06	$ 27.09	$2.01	$ 27.09	$2.01	30.03	.55
2-Row Cultivator	23.47	.08	23.91	.05	23.29	.10	23.58	.09	25.70	.03
Fertilizer Attach.	10.20	.18	10.35	.15	10.12	.30	10.12	.30	11.14	.08
2-Row Lister	22.70	.43	22.70	.32						
4-Row Lister					37.86	1.91	37.85	1.27	42.06	.54
4-Row Lister Planter	55.00	2.04	55.90	1.63	54.68	3.20	55.80	2.38	60.15	.88
7' Offset Disk					42.23	.65	44.64	.42	45.53	.26
7 1/2' Offset Disk	51.41	.48	51.41	.35						
10' Offset Disk									69.32	1.10
2-Row Potato Planter and Fertilizer Attach.	80.72	2.19	86.02	1.41	78.01	4.56	81.09	3.00	84.65	1.54
2-16" 2-Way Plow					46.32	.74	46.32	.64		
7' Power Mower	25.93	.27			24.09	.96			26.73	.22
8' Side Delivery Rake	45.31	.51			42.26	1.68			46.78	.41
12' Spike Harrow	7.34	.19	7.56	.15	7.22	.36	7.29	.32	8.01	.11
2-Row Stalk Cutter	12.99	.34	13.20	.27	12.86	.57	12.86	.57	14.21	.14
6' Steel Roller	14.49	1.61	15.40	1.07	14.06	3.12	14.71	2.04	15.40	1.07
TOTAL	$414.10		$353.35		$420.09		$361.35		$520.44	

TABLE 7

Comparative Costs of Pumping and Delivering Irrigation Water
on 80, 160 and 320 Acre Farms with Selected Organizations

	Total Overhead	Power	Oil and Grease	Repairs	Total
Farm I (160 Acres)					
Cost Per Year	$1,418.19	$1,912.02	$ 66.00	$263.81	$3,660.02
Cost Per Crop Acre	9.45	12.75	.44	1.76	24.40
Cost Per Acre Foot of Water	2.61	3.52	.12	.49	6.74
Farm II (160 Acres)					
Cost Per Year	1,418.19	1,723.91	66.00	216.30	3,424.40
Cost Per Crop Acre	9.45	11.49	.44	1.44	22.82
Cost Per Acre Foot of Water	3.19	3.87	.15	.49	7.70
Farm III (80 Acres)					
Cost Per Year	809.41	979.46	41.25	131.25	1,961.37
Cost Per Crop Acre	10.79	13.06	.55	1.75	26.15
Cost Per Acre Foot of Water	3.23	3.91	.16	.52	7.83
Farm IV (80 Acres)					
Cost Per Year	809.41	1,020.38	41.25	190.71	2,061.75
Cost Per Crop Acre	10.79	13.61	.55	2.54	27.49
Cost Per Acre Foot of Water	3.01	3.80	.15	.71	7.67
Farm V (320 Acres)					
Cost Per Year	2,643.07	2,707.24	115.50	477.35	5,943.16
Cost Per Crop Acre	8.81	9.02	.39	1.59	19.81
Cost Per Acre Foot of Water	2.57	2.63	.11	.46	5.77

in other studies and as reported by farmers interviewed.[10] Servicing charges were computed by multiplying the amount of the driver's time devoted yearly to servicing by the wage rate of the driver.

The annual cost incurred in operating a piece of farm equipment (not self-powered) is the sum of overhead and repair costs. Repair costs are computed as for tractors with one minor exception.[11] Irrigation water costs include overhead on pumping plant and irrigation system, plus power, repairs, and oil and grease. Power charges are obtained by applying appropriate power rates to the power requirements based on annual use. (See Appendix Table 24.) Oil and grease charges are based on a flat rate per horsepower per day operated. Annual repair charges are a sum of repair charges for motor and pumps.[12]

These input and cost data are included to permit computing production costs on selected crops. The decline in cost per hour operated as the total operating time increases is very apparent (Table 5). The variation in tractor operating costs as farm size and organization vary is better illustrated by weighting the annual cost by the hours operated for each tractor in the organization and computing a composite per hour of operation cost for tractor power on each farm.

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10/ The method used for estimating repairs is as follows: for 80 acre farms a flat 3 per cent of the original cost is used; for the 160 and 320 acre farms 3 per cent of the original cost is taken and then only 70 per cent of this amount is charged assuming that with the farm repair shops as equipped, the repair labor costs would be reduced 50 per cent with costs of parts remaining unchanged, and an average division of 60 per cent labor and 40 per cent parts on the typical repair bill.

11/ The annual use made of equipment on the 320 acre farms (Farm V) was considered as a standard. For other sizes and organizations, the repair costs were reduced in proportion to the difference in annual use for a given piece of equipment in the particular farm in question and the same piece of equipment in the 320 acre farm.

12/ An established method was used in calculating each. The annual repairs for motors were obtained by dividing 1/3 of the first cost by 20,000 and multiplying the result by the number of hours run during the year. Pump repairs were obtained by dividing $\frac{1}{4}$ of the first cost by 11,000 and multiplying by the number of hours run.

[9] The method used for combining production in various years to obtain a per cent of the original cost is usually for the 5th year, (b) some more than 3 but less than 4 years, and so on. The method used at this present is somewhat that with the Pierce-Arrow type engine, the reserve [illegible] would be reduced 5% per year until a cost of 4 cents remained, and an extreme limit of 60 per cent [illegible] and 40 per cent on the [illegible] period.

[10] The method used in the 5th Avenue Farms (item 7) was described as a standard. For other firms the [illegible] was given consideration in the [illegible] in order [illegible] where of equipment in the 3rd Avenue Farms.

[11] A more liberal method was used in computing [illegible] per cent for the motors were obtained by dividing 1/3 of the first cost by 20,000 and multiplying the result by the number of hours run during the year". Some motors were obtained by dividing 1/3 of the first cost by 15,000 and multiplying by the number of hours run.

Comparative Operation Costs for all Tractors on the Five Farms of Selected Size and Organization.

Farm	Weighted Average Cost per Hour Operated a/
Farm I (160 acres)	$ 1.16
Farm II (160 acres)	1.11
Farm III (80 acres)	1.39
Farm IV (80 acres)	1.28
Farm V (320 acres)	1.01

a/ Annual costs for each tractor are weighted by its annual use.

Comparing farms similarly organized (I, III, and V) the costs per hour decline as size increases but minor organization differences are also reflected in these data. Also, the effects of purely organizational changes are in evidence in comparing the per hour operation costs on the W-3 tractor for farms III and IV. A reduction of eleven cents per hour is attained by altering the organization such that the annual tractor use is increased from 518.4 hours to 641.7 hours. In all of the three farms where the DT-3 is employed, the use made of this tractor has not been sufficient to reduce the per hour cost to a level reflecting a near unit capacity usage. Overhead costs are such as to demand a more intensive use of the DT-3 if cost of operation is to be considered economical.

The same conclusion can be drawn for equipment costs. For any given piece of equipment common to the organizations of all five farms, the cost per hour operated declines significantly as the size of farm increases (Table 6). This results from a more intensive utilization of the equipment on the larger farms. It is also clear that changes in farm organization on a given farm affect equipment costs significantly.

A study of the costs of pumping and transporting irrigation water on the farm also indicates that reduced costs with increasing farm size are to be expected (Table 7). It is to be noted, however, that organizational changes play a large part in changing water costs on a farm. Shifts from crops using moderate amounts to crops using large amounts of water tend to reduce per acre foot water costs largely because of the structure of power rates, but other factors such as labor costs and enterprise interrelationships

Comparative depreciation charges for all Treasury
on the five terms of depreciation.
depreciation.

Term I (10% annual)	[illegible]
Term II (20% annual)	[illegible]
Term III (5% annual)	[illegible]
Term IV (on annual)	[illegible]
Term V (30% annual)	[illegible]

[illegible] charge for each Treasury as indicated by its
[illegible] use.

must be considered in arriving at any net effects of such shifts.

Typical Production Costs Per Acre and Per Unit for Cotton and Potatoes

The data presented in the previous sections for Northern Kern County have established: (1) the size and organizational characteristics of cotton-potato farms; (2) the natural factors bearing on agricultural production; (3) the physical input-output relationships for the principal enterprises; and (4) the price-cost pattern existing in the 1949-50 production year, including the derived annual costs per hour or per acre foot for power units, other farm equipment, and irrigation water. These data are now brought together and attention is focused on the typical costs[13/] per acre and per unit of output for cotton and potatoes on the five farms described previously. Both size and organization influences on average unit production costs and on particular cost components are shown.

Given the farm size, farm organization, physical inputs and practices, any variation in prices paid by farm operators for factors of production will result in cost variation. These prices will vary with the general price level, with the price level of closely related goods and services, and as a result of specific conditions surrounding the price-making of each good and service. Therefore, these cost data presented are typical only in the sense that they reflect organization, size, practices, inputs, and prices found to exist in 1949 and early 1950. Changes in size and organizational structure tend to take place rather slowly but practices, inputs and prices may change rapidly with the introduction of new machines or techniques and with changing economic conditions.

To facilitate analysis and comparison, the inputs and their costs for cotton and potato production have been arranged in six groups, each group being subtotaled (Tables 8 through 17). These six groups are: labor, contracted and piece work, motive power, farm equipment, materials, and miscellaneous.

13/ Typical in the sense that they represent costs determined by the application of the most frequently observed cost rates for inputs to the most common practices and inputs for the farm organizations and sizes studied.

Costs for Producing Cotton.--An examination of the total cotton production costs per acre and per bale for the five farms indicates the influence of both organization and scale on these costs (Tables 8 through 12). Furthermore, it reveals that under 1949 conditions major differences in cost components were hidden by the approximate equality of total costs. On Farm I of 160 acres with cotton, potatoes and alfalfa the cost per acre for producing cotton was $222.64 and per bale $106.02. On a farm of only 80 acres but organized similarly, the cost per acre rose to $233.03, resulting in a per bale increase to nearly $111.00. The cost per acre on the 320 acre farm was $216.30 and the per bale cost $103.00. This indicates a reduction of approximately $8.00 per bale as the farm size increases from 80 to 320 acres with nearly comparable organizations maintained. The important sources of these cost reductions are in motive power and water costs, with small savings occurring in farm equipment costs. Total motive power costs per acre decline from $12.32 on the 80 acre farm to $8.62 on the 320 acre farm. Water costs show a decline from $25.06 to $18.46 when comparing the 80 and 320 acre farms with similar organizations. These declines reflect primarily the more efficient use of physical facilities, but also slight savings accruing from purchasing and rate structures advantageous to larger farm operations.14/

The influence of organization can be shown by comparing Farm I with Farm II and Farm III with Farm IV. Here the sizes remain the same but organizations vary. Cotton production costs on Farm I at $222.64 per acre are only slightly lower than the $223.88 shown for Farm II. Examination of components of total cost indicates a saving in water costs, but a significant part of this saving is offset by the increased motive power and machinery costs incurred on Farm I. The differences are explained entirely by organizational variations which are being reflected in resource utilization. On Farm I, the presence of alfalfa lengthens the irrigation

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14/ These comparisons do not reflect scale differences alone. Minor organizational differences exist which tend to overstate slightly the cost advantages of scale between the 80 and 160 acre farm and understate those between the 160 and 320 acre farm. The comparison between the 80 and 320 acre farm more nearly reflect purely scale differences. Comparison of cost elements at this level is not hampered by these variations in organization between farms I, III, and V but income and net returns analysis would require exact comparability if results were to be at all indicative of scale relationships.

TABLE 8

Cost of Producing Cotton on Farm I (160 Acres)
(Yield: 2.1 bales per acre)

Inputs	Units of Inputs per Acre (hours)	Cost per Unit of Input	Total Cost
Labor:			
Tractor Driver	7.9	$ 1.00	$ 7.90
Irrigator	10.1	.80	8.08
General	1.3	.80	1.04
Total Labor			17.02
Contracted and Piece Work:			
Chopping	5.3	.75	3.98
Hoeing	3.8	.75	2.85
Picking, Hand a/			95.55
Dusting (2 times) b/			2.40
Defoliating c/			4.00
Ginning ($12.79/bale)			26.86
Total Contracted and Piece Work			135.64
Motive Power:			
W-2	6.3	.71	4.47
DT-3	1.6	2.72	4.35
½ Ton Pick-up Truck (miles)	15.0	.07	1.05
Total Motive Power			9.87
Farm Equipment:			
2-Row Stalk Cutter	.5	.34	.17
7½' Offset Disk Harrow	1.0	.48	.48
8' Chisel	.6	.56	.34
2-Row Lister	.5	.43	.22
2-Row Cultivator	4.4	.08	.35
12' Spike Harrow (3-4' sect.)	.3	.19	.06
4-Row Lister Planter	.3	2.04	.61
10' Cultipacker	.3	1.27	.38
2-Row Fertilizer Attach.	.7	.18	.13
5-Bale Cotton Trailer	1.0	.64	.64
Total Equipment			3.38

Continued-

Table 8 continued

Inputs	Units of Inputs per Acre (hours)	Cost per Unit of Input	Total Cost
Materials:			
Seed (lbs.)	30.0	$ .06	$ 1.80
Water (Acre feet)	3.2	6.74	21.57
Fertilizer (lbs.) d/	325.0	.0266	8.65
Dust (lbs.) e/	60.0	.0545	3.27
Total Materials			35.29
Miscellaneous:			
Compensation Insurance f/			.19
Taxes			6.25
Interest (5% of $300)			15.00
Total Miscellaneous			21.44
Total Cost per Acre			$222.64
Total Cost per Bale			$106.02

a/ Picking rate calculated on basis of 300# hand picked seed cotton per man per 9 hrs. picking, 1,400# seed cotton per bale of lint. Usually contracted for on cwt. seed cotton basis, the charge being $3.25/cwt. in 1949 and 1950. For a yield of 2.1 bales, man hr. requirements would approximate 88.2 man hrs. per acre.

b/ Application charge only. Usual charge was 4¢/lb., 60# applied.

c/ Includes application and materials.

d/ 21% dry ammonium sulfate.

e/ 5% DDT, 50% Sulfur.

f/ $1.10/$100 payroll.

TABLE 9

Cost of Producing Cotton on Farm II (160 Acres)
(Yield: 2.1 bales per acre)

Inputs	Units of Inputs per Acre (hours)	Cost per Unit of Input	Total Cost
Labor:			
Tractor Driver	7.9	$ 1.00	$ 7.90
Irrigator	10.1	.80	8.08
General	1.3	.80	1.04
Total Labor			17.02
Contracted and Piece Work:			
Chopping	5.3	.75	3.98
Hoeing	3.8	.75	2.85
Picking, Hand a/			95.55
Dusting (2 times) b/			2.40
Defoliating c/			4.00
Ginning ($12.79/bale)			26.86
Total Contracted and Piece Work			135.64
Motive Power:			
W-2	6.3	.72	4.54
DT-3	1.6	2.03	3.25
½ Ton Pick-up Truck (miles)	15.0	.07	1.05
Total Motive Power			8.84
Farm Equipment:			
2-Row Stalk Cutter	.5	.27	.14
7½' Offset Disk Harrow	1.0	.35	.35
8' Chisel	.6	.42	.25
2-Row Lister	.5	.32	.16
2-Row Cultivator	4.4	.05	.22
12' Spike Harrow (3-4' Sect.)	.3	.15	.04
4-Row Lister Planter	.3	1.63	.49
10' Cultipacker	.3	1.06	.32
2-Row Fertilizer Attach.	.7	.15	.10
5-Bale Cotton Trailer	1.0	.51	.51
Total Equipment			2.58

Continued-

Table 9

Cost of Producing Grain on Farm 12 (150 Acres)
(Yield: 3.1 Dollar per Acre)

Item	Dollar per Acre	Dollar per Unit
Expenses		
Seed	0.4	0.13
Fertilizer	0.7	0.23
Total Labor	0.3	0.10
Combustion and Power Tools:		
Gasoline	0.2	0.06
Tractor	0.4	0.13
Power Saw, Chain 1/		
Sprayer, (1 Gallon) 1/		
Jet Pump Motor 1/		
Electric Motor:		
Power Tools		
Farm Structures:		
[illegible]	0.1	0.03
[illegible]	0.2	0.06
Farm Machinery:		
[illegible]	0.1	0.03
[illegible]	0.1	0.03
[illegible]	0.1	0.03

Table 9 continued

Inputs	Units of Inputs per Acre (hours)	Cost per Unit of Input	Total Cost
Materials:			
Seed (lbs.)	30.0	$ .06	$ 1.80
Water (Acre feet)	3.2	7.70	24.64
Fertilizer (lbs.) d/	325.0	.0266	8.65
Dust (lbs.) e/	60.0	.0545	3.27
Total Materials			38.36
Miscellaneous:			
Compensation Insurance f/			.19
Taxes			6.25
Interest (5% of $300)			15.00
Total Miscellaneous			21.44
Total Cost per Acre			$223.88
Total Cost per Bale			$106.61

a/ Picking rate calculated on basis of 300# hand picked seed cotton per man per 9 hrs. picking, 1,400# seed cotton per bale of lint. Usually contracted for on cwt. seed cotton basis, the charge being $3.25/cwt. in 1949 and 1950. For a yield of 2.1 bales, man hr. requirements would approximate 88.2 man hrs. per acre.

b/ Application charge only. Usual charge was 4¢/lb., 60# applied.

c/ Includes application and materials.

d/ 21% dry ammonium sulfate.

e/ 5% DDT, 50% Sulfur.

f/ $1.10/$100 payroll.

Item			

TABLE 10

Cost of Producing Cotton on Farm III (80 Acres)
(Yield: 2.1 bales per acre)

Inputs	Units of Inputs per Acre (hours)	Cost per Unit of Input	Total Cost
Labor:			
Tractor Driver	8.0	$ 1.00	$ 8.00
Irrigator	12.5	.80	10.00
General	1.3	.80	1.04
Total Labor			19.04
Contracted and Piece Work:			
Chopping	5.3	.75	3.98
Hoeing	3.8	.75	2.85
Picking, Hand a/			99.55
Dusting (2 times) b/			2.40
Defoliating c/			4.00
Ginning ($12.79/bale)			26.86
Total Contracted and Piece Work			135.64
Motive Power:			
W-3	8.0	1.39	11.12
½ Ton Pick-up Truck (miles)	15.0	.08	1.20
Total Motive Power			12.32
Farm Equipment:			
2-Row Stalk Cutter	.4	.57	.23
7' Offset Disk Harrow	1.0	.65	.65
2-16" 2-Way Plow	1.0	.74	.74
4-Row Lister	.3	1.91	.57
12' Spike Harrow	.3	.36	.11
4-Row Lister Planter	.3	3.20	.96
10' Cultipacker	.3	2.01	.60
2-Row Cultivator	4.4	.10	.44
2-Row Fertilizer Attach.	.7	.30	.21
5-Bale Cotton Trailer	1.0	1.28	1.28
Total Equipment			5.79

Continued-

Table 10 continued

Inputs	Units of Inputs per Acre (hours)	Cost-per Unit of Input	Total Cost
Materials:			
Seed (lbs.)	30.0	$ .06	$ 1.80
Water (Acre feet)	3.2	7.83	25.06
Fertilizer (lbs) d/	325.0	.0266	8.65
Dust (lbs.) e/	60.0	.0545	3.27
Total Materials			38.78
Miscellaneous:			
Compensation Insurance f/			.21
Taxes			6.25
Interest (5% of $300)			15.00
Total Miscellaneous			21.46
Total Cost per Acre			$233.03
Total Cost per Bale			$110.97

a/ Picking rate calculated on basis of 300# hand picked seed cotton per man per 9 hrs. picking, 1,400# seed cotton per bale of lint. Usually contracted for on cwt. seed cotton basis, the charge being $3.25/cwt. in 1949 and 1950. For a yield of 2.1 bales, man hr. requirements would approximate 88.2 man hrs. per acre.

b/ Application charge only. Usual charge was 4¢/lb., 60# applied.

c/ Includes application and materials.

d/ 21% dry ammonium sulfate.

e/ 5% DDT, 50% Sulfur.

f/ $1.10/$100 payroll.

TABLE 11

Cost of Producing Cotton on Farm IV (80 Acres)
(Yield: 2.1 Bales per acre)

Inputs	Units of Inputs per Acre (hours)	Cost per Unit of Input	Total Cost
Labor:			
Tractor Driver	8.0	$ 1.00	$ 8.00
Irrigator	12.5	.80	10.00
General	1.3	.80	1.04
Total Labor			19.04
Contracted and Piece Work:			
Chopping	5.3	.75	3.98
Hoeing	3.8	.75	2.85
Picking, Hand a/			99.55
Dusting (2 times) b/			2.40
Defoliating c/			4.00
Ginning ($12.79/bale)			26.86
Total Contracted and Piece Work			135.64
Motive Power:			
W-3	8.0	1.28	10.24
½ Ton Pick-up Truck (miles)	15.0	.08	1.20
Total Motive Power			11.44
Farm Equipment:			
2-Row Stalk Cutter	.4	.57	.23
7' Offset Disk Harrow	1.0	.42	.42
2-16" 2-Way Plow	1.0	.64	.64
4-Row Lister	.3	1.27	.38
12' Spike Harrow	.3	.32	.10
4-Row Lister Planter	.3	2.38	.71
10' Cultipacker	.3	2.01	.60
2-Row Cultivator	4.4	.09	.40
2-Row Fertilizer Attach.	.7	.30	.21
5-Bale Cotton Trailer	1.0	1.28	1.28
Total Equipment			4.97

Continued-

Dose of Prophylaxis Quinine on Days IV (10 Days)
(Figure 5.1 Tabs per day)

Table 11 continued

Inputs	Units of Inputs per Acre (hours)	Cost per Unit of Input	Total Cost
Materials:			
Seed (lbs.)	30.0	$ .06	$ 1.80
Water (Acre feet)	3.2	7.67	24.54
Fertilizer (lbs.) d/	325.0	.0266	8.65
Dust (lbs.) e/	60.0	.0545	3.27
Total Materials			38.26
Miscellaneous:			
Compensation Insurance f/			.21
Taxes			6.25
Interest (5% of $300)			15.00
Total Miscellaneous			21.46
Total Cost per Acre			$230.81
Total Cost per Bale			$109.91

a/ Picking rate calculated on basis of 300# hand picked seed cotton per man per 9 hrs. picking, 1,400# seed cotton per bale of lint. Usually contracted for on cwt. seed cotton basis, the charge being $3.25/cwt. in 1949 and 1950. For a yield of 2.1 bales, man hr. requirements would approximate 88.2 man hrs. per acre.

b/ Application charge only. Usual charge was 4¢/lb., 60# applied.

c/ Includes application and materials.

d/ 21% dry ammonium sulfate.

e/ 5% DDT, 50% Sulfur.

f/ $1.10/$100 payroll.

TABLE 12

Cost of Producing Cotton on Farm V (320 Acres)
(Yield: 2.1 bales per acre)

Inputs	Units of Inputs per Acre (hours)	Cost per Unit of Input	Total Cost
Labor:			
Tractor Driver	7.4	$ 1.00	$ 7.40
Irrigator	10.1	.80	8.08
General	1.3	.80	1.04
Total Labor			16.52
Contracted and Piece Work:			
Chopping	5.3	.75	3.98
Hoeing	3.8	.75	2.85
Picking, Hand a/			95.55
Dusting (2 times) b/			2.40
Defoliating c/			4.00
Ginning ($12.79/bale)			26.86
Total Contracted and Piece Work			135.64
Motive Power:			
W-2	3.9	.60	2.34
W-3	2.6	1.14	2.96
BT-3	.9	2.69	2.42
½ Ton Pick-up Truck (miles)	15.0	.06	.90
Total Motive Power			8.62
Farm Equipment:			
8' Chisel	.6	.27	.16
10' Cultipacker	.3	.55	.16
2-Row Cultivator (2)	4.4	.03	.13
2-Row Fertilizer Attach.	.7	.08	.06
4-Row Lister	.3	.54	.16
4-Row Lister Planter	.3	.88	.26
7' Offset Disk Harrow	.6	.26	.16
10' Offset Disk Harrow	.3	2.09	.63
12' Spike Harrow	.3	.11	.03
5-Bale Cotton Trailer	1.0	.16	.16
Total Equipment			1.91

Continued-

Table 12 continued

Inputs	Units of Inputs per Acre (hours)	Cost per Unit of Input	Total Cost
Materials:			
Seed (lbs.)	30.0	$ .06	$ 1.80
Water (Acre feet)	3.2	5.77	18.46
Fertilizer (lbs.) d/	325.0	.0266	8.65
Dust (lbs.) e/	60.0	.0545	3.27
Total Materials			32.18
Miscellaneous:			
Compensation Insurance f/			.18
Taxes			6.25
Interest (5% of $300)			15.00
Total Miscellaneous			21.43
Total Cost per Acre			$216.30
Total Cost per Bale			$103.00

a/ Picking rate calculated on basis of 300# hand picked seed cotton per man per 9 hrs. picking, 1,400# seed cotton per bale of lint. Usually contracted for on cwt. seed cotton basis, the charge being $3.25/cwt. in 1949 and 1950. For a yield of 2.1 bales, man hr. requirements would approximate 88.2 man hrs. per acre.

b/ Application charge only. Usual charge was 4¢/lb., 60# applied.

c/ Includes application and materials.

d/ 21% dry ammonium sulfate.

e/ 5% DDT, 50% Sulfur.

f/ $1.10/$100 payroll.

season and calls for near full capacity pumping through a large part of the growing season. On Farm II the absence of alfalfa and increased acreage of cotton and potatoes reduces the total equipment investment and also makes for a nearer optimum use of this equipment. Thus it is seen that organizational changes can affect costs, although the main attention in the modifying of organization is usually focused on the resultant increases or decreases in total income. Comparing Farms III and IV which are organized differently but similar in size, a difference of $2.22 in cost per acre is found. The double cropping on Farm IV permitted increased tractor and equipment use and more nearly optimum use of the pumping plant, because of the complementary relationship existing between milo and potatoes in the organization.

The fact that organizational and scale changes did not result in more significant per acre cost changes is partly explained by the cost-price assumptions used for this study and partly by the tendency of particular cost components to move counter to one another as farm organization and size change.

The adoption of other sets of factor prices typical of different years (where relative factor prices differ significantly) might yield very different results. For example, an increase in labor costs combined with the mechanization of some process previously requiring a considerable labor force might reduce costs of production for producers with planted acreage sufficient to utilize economically the machine. A large farm operator might have sufficient acreage to permit adoption of the machine and reduce his cost of production directly. A smaller operator might be able to shift his organization as a result of the change in budgeted net returns to include an acreage of the particular enterprise commensurate with economic utilization. The small operator may not be able to do either and must, therefore, continue with high cost labor or contract for the work. This illustrates the fact that scale and organization are both sources of saving in costs and in some instances are difficult to separate. An example of a machine replacing high cost labor in this study area is provided by the mechanical picking, loading, and bulk hauling of early potatoes.

Costs of Producing Potatoes.--The per acre variation in potato costs on the five farms shows similar effects of size and organization variation (Tables 13 through 17). On the 80 acre farm (Farm III) the cost was $443.97

TABLE 13

Cost of Producing Potatoes on Farm I (160 Acres)
(Yield: 290 cwt. per acre)

Inputs	Units of Inputs per Acre (hours)	Cost per Unit of Input	Total Cost
Labor:			
Tractor Driver	4.9	$ 1.00	$ 4.90
Irrigator	8.6	.80	6.88
General	1.2	.80	.96
Total Labor			12.74
Contracted and Piece Work:			
Cutting Seed a/			4.50
Dusting b/			1.20
Rotobeating ($3.00/acre)			3.00
Digging c/			10.00
Picking d/			40.60
Hauling ($.10/cwt.) e/			29.00
Shed Costs f/			145.00
Total Contracted and Piece Work			233.30
Motive Power:			
W-2	2.1	.71	1.49
DT-5	2.8	2.72	7.62
Total Motive Power			9.11
Farm Equipment:			
2-Row Lister	.5	.43	.22
7½' Offset Disk Harrow	1.0	.48	.48
8' Chisel	.6	.56	.34
8' Spike Harrow (2-4' sections)	.5	.13	.06
2-Row Potato Planter and Fertilizer Attachment	1.2	2.19	2.63
12' Spike Harrow (3-4' sections)	.3	.19	.06
2-Row Cultivator	1.0	.08	.08
6' Steel Roller	.3	1.61	.48
Total Equipment			4.35

Continued-

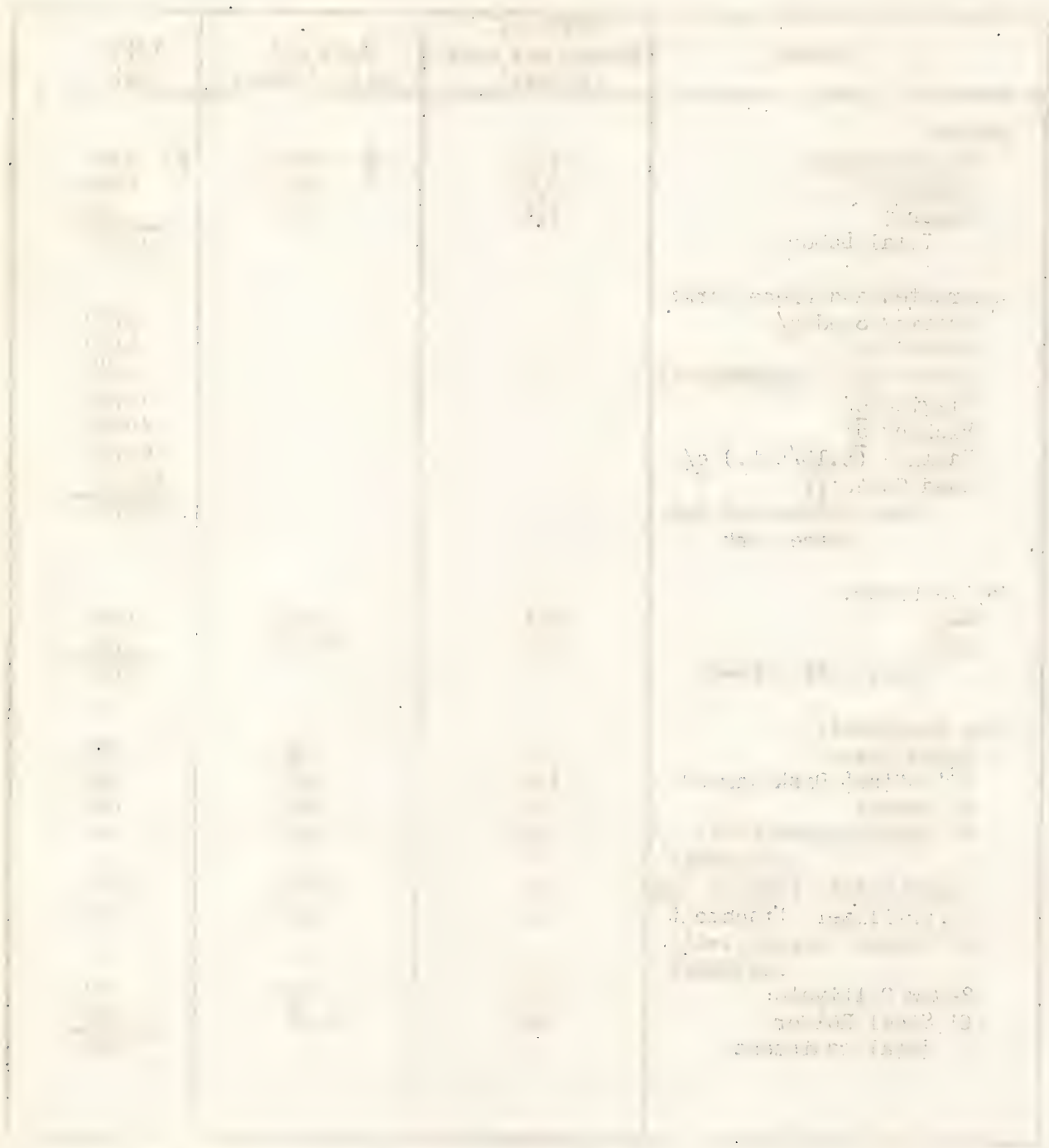

Table 13 continued

Inputs	Units of Inputs per Acre (hours)	Cost per Unit of Input	Total Cost
Materials:			
Seed, dipped (cwt)	18.0	$ 5.00	$ 90.00
Water (Acre feet)	2.6	6.74	17.52
Fertilizer (lbs) g/	825.0	.0266	21.95
Gypsum, refined (tons)	2.0	12.00	24.00
Dust (lbs) h/	30.0	.0545	1.64
Gypsum, commercial (lbs) i/	500.0	.006	3.00
Total Materials			158.11
Miscellaneous:			
Compensation Insurance j/			.14
Taxes			6.25
Interest (5% of $300)			15.00
Total Miscellaneous			21.39
Total Cost Per Acre			$439.00
Total Cost Per Cwt.			$ 1.51

a/ Usual piece work, the 1949-50 rate being $.25/cwt. Average worker can cut 29 cwt/9 hrs.

b/ Application charge only. Potatoes dug after June 15 would receive a second dusting, adding $2.84 per acre to the cost or about $.01 per sack.

c/ Usually contracted, the 1949-50 rate being $10.00/acre. Physical inputs approximate 1.5 tractor hrs. and machine hrs. and 3 man hrs.

d/ Usually contracted, the 1949-50 rate being $.14/cwt. ($.12 for the picker and $.02 for the contractor). In 10 hrs. the average picker will pick 80 cwt., requiring 36 man hrs. to pick an acre if the yield is 290 cwt.

e/ Varies with distance hauled. $2.00/ton represents an average hauling charge based on field survey data.

f/ Includes washing, grading, sacking, and loading for which the grower is charged $.50/cwt.

g/ 21% dry Ammonium Sulfate.

h/ 5% DDT, 50% Sulfur.

i/ Applied in the water

j/ $1.10/$100 of payroll.

TABLE 14

Cost of Producing Potatoes on Farm II (160 Acres)
(Yield: 290 cwt. per acre)

Inputs	Units of Inputs per Acre (hours)	Cost per Unit of Input	Total Cost
Labor:			
Tractor Driver	4.9	$ 1.00	$ 4.90
Irrigator	8.6	.80	6.88
General	1.2	.80	.96
Total Labor			12.74
Contracted and Piece Work:			
Cutting Seed a/			4.50
Dusting b/			1.20
Rotobeating ($3.00/acre)			3.00
Digging c/			10.00
Picking d/			40.60
Hauling ($.10/cwt.) e/			29.00
Shed Costs f/			145.00
Total Contracted and Piece Work			233.30
Motive Power:			
W-2	2.1	.72	1.51
DT-5	2.8	2.03	5.68
Total Motive Power			7.19
Farm Equipment:			
2-Row Lister	.5	.32	.16
7½' Offset Disk Harrow	1.0	.35	.35
8' Chisel	.6	.42	.25
8' Spike Harrow (2-4' sections)	.5	.10	.05
2-Row Potato Planter and Fertilizer Attachment	1.2	1.41	1.69
12' Spike Harrow (3-4' sections)	.3	.15	.04
2-Row Cultivator	1.0	.05	.05
6' Steel Roller	.3	1.07	.32
Total Equipment			2.91

Continued-

Table 14 continued

Inputs	Units of Inputs per Acre (hours)	Cost per Unit of Input	Total Cost
Materials:			
Seed, dipped (cwt)	18.0	$ 5.00	$ 90.00
Water (Acre feet)	2.6	7.70	20.02
Fertilizer (lbs.) g/	825.0	.0266	21.95
Gypsum, refined (tons)	2.0	12.00	24.00
Dust (lbs.) h/	30.0	.0545	1.64
Gypsum, commercial (lbs.) i/	500.0	.006	3.00
Total Materials			160.61
Miscellaneous:			
Compensation Insurance j/			.14
Taxes			6.25
Interest (5% of $300)			15.00
Total Miscellaneous			21.39
Total Cost per Acre			438.14
Total Cost per Cwt.			1.51

a/ Usual piece work, the 1949-50 rate being $.25/cwt. Average worker can cut 29 cwt/9 hrs.

b/ Application charge only. Potatoes dug after June 15 would receive a second dusting, adding $2.84 per acre to the cost or about $.01 per sack.

c/ Usually contracted, the 1949-50 rate being $10.00/acre. Physical inputs approximate 1.5 tractor hrs. and machine hrs. and 3 man hrs.

d/ Usually contracted, the 1949-50 rate being $.14/cwt. ($.12 for the picker and $.02 for the contractor). In 10 hrs. the average picker will pick 80 cwt., requiring 36 man hrs. to pick an acre if the yield is 290 cwt.

e/ Varies with distance hauled. $2.00/ton represents an average hauling charge based on field survey data.

f/ Includes washing, grading, sacking, and loading for which the grower is charged $.50/cwt.

g/ 21% dry Ammonium Sulfate.

h/ 5% DDT, 50% Sulfur.

i/ Applied in the water.

j/ $1.10/$100 of payroll.

Table 12.--Continued.

Item	Units per acre	Cost per unit	Total
Insecticide (lbs.) 2/	1.0	.0256	$1.02
Sulfur, refined (lbs.)	5.0	.10	.50
Dust (lbs.) 3/	40.	.0845	3.38
Arsenate, combinations (lbs.) 4/	5.0	.065	.33
Total materials			105.63
Compensation insurance 5/			.14
Taxes 6/			.00
Interest (6% of $100)			1.00
Total labor and materials			71.80
Total Cost per acre			176.14
Total Cost per Cwt.			1.81

1/ 6-8 wt/c lbs.

2/ Application charge only. Potatoes dug after June 15 will receive a second dosing, adding $.25-.50 per acre to the cost or about $ .01 per sack.

3/ Usually combination, the 1.1-50 rate being $12.00/acre. Physical figured approximate 1.5 tractor hrs. and machine hrs. and 3 man hrs.

4/ Usually concentrated, the 1.1-50 rate being $.14/cwt. (.12 for the dipper and $.0 for the application). In 10 hrs. the operator will work 90 cwt., requiring 85 man hrs. to pick an acre if the yield is 180 cwt.

5/ Varies with distance hauled. $.00/ton representing an average hauling charge based on field survey data.

6/ Includes rental, reading, seeding, and loading for which the grower is charged $ .00/acre.

7/ 21% dry ammonium sulfate.

8/ Applied in the water.

9/ 1.1% 1-0 of mercol.

TABLE 15

Cost of Producing Potatoes on Farm III (80 Acres)
(Yield: 290 cwt. per acre)

Inputs	Units of Inputs per Acre (hours)	Cost per Unit of Input	Total Cost
Labor:			
Tractor Driver	5.0	$ 1.00	$ 5.00
Irrigator	9.3	.80	7.44
General	1.1	.80	.88
Total Labor			13.32
Contracted and Piece Work:			
Cutting Seed a/			4.50
Dusting b/			1.20
Rotobeating ($3.00/acre)			3.00
Digging c/			10.00
Picking d/			40.60
Hauling ($.10/cwt) e/			29.00
Shed Costs f/			145.00
Total Contracted and Piece Work			233.30
Motive Power:			
W-3	5.0	1.39	6.95
Total Motive Power			6.95
Farm Equipment:			
4-Row Lister	.3	1.91	.57
7' Offset Disk Harrow	1.0	.65	.65
2-16" 2-Way Plow	1.0	.74	.74
8' Spike Harrow (2-4' sections)	.5	.24	.12
2-Row Potato Planter and Fertilizer Attachment	1.1	4.56	5.02
12' Spike Harrow (3-4' sections)	.3	.36	.11
2-Row Cultivator	1.0	.10	.10
6' Steel Roller	.3	3.12	.94
Total Equipment			8.25

Continued-

Table 15 continued

Inputs	Units of Inputs per Acre (hours)	Cost per Unit of Input	Total Cost
Materials:			
Seed, dipped (cwt.)	18.0	$ 5.00	$ 90.00
Water (Acre feet)	2.6	7.83	20.16
Fertilizer (lbs.) g/	825.0	.0266	21.95
Gypsum, refined (tons)	2.0	12.00	24.00
Dust (lbs.) h/	30.0	.0545	1.64
Gypsum, commercial (lbs.) i/	500.0	.006	3.00
Total Materials			160.75
Miscellaneous:			
Compensation Insurance j/			.15
Taxes			6.25
Interest (5% of $300)			15.00
Total Miscellaneous			21.40
Total Cost per Acre			$ 445.97
Total Cost per Cwt.			$ 1.53

a/ Usual piece work, the 1949-50 rate being $.25/cwt. Average worker can cut 29 cwt/9 hrs.

b/ Application charge only. Potatoes dug after June 15 would receive a second dusting, adding $2.84 per acre to the cost or about $.01 per sack.

c/ Usually contracted, the 1949-50 rate being $10.00/acre. Physical inputs approximate 1.5 tractor hrs. and machine hrs. and 3 man hrs.

d/ Usually contracted, the 1949-50 rate being $.14/cwt. ($.12 for the picker and $.02 for the contractor). In 10 hrs. the average picker will pick 80 cwt., requiring 36 man hrs. to pick an acre if the yield is 290 cwt.

e/ Varies with distance hauled. $2.00/ton represents an average hauling charge based on field survey data.

f/ Includes washing, grading, sacking, and loading for which the grower is charged $.50/cwt.

g/ 21% dry Ammonium Sulfate.

h/ 5% DDT, 50% Sulfur.

i/ Applied in the water .

j/ $1.10/$100 of payroll.

TABLE 16

Cost of Producing Potatoes on Farm IV (80 Acres)
(Yield: 290 cwt. per acre)

Inputs	Units of Inputs per Acre (hours)	Cost per Unit of Input	Total Cost
Labor:			
Tractor Driver	5.0	$ 1.00	$ 5.00
Irrigator	9.3	.80	7.44
General	1.1	.80	.88
Total Labor			13.32
Contracted and Piece Work:			
Cutting Seed a/			4.50
Dusting b/			1.20
Rotobeating ($3.00/acre)			3.00
Digging c/			10.00
Picking d/			40.60
Hauling ($.10/cwt) e/			29.00
Shed Costs f/			145.00
Total Contracted and Piece Work			233.30
Motive Power:			
W-3	5.0	1.28	6.40
Total Motive Power			6.40
Farm Equipment:			
4-Row Lister	.3	1.27	.38
7' Offset Disk Harrow	1.0	.42	.42
2-16" 2-way Plow	1.0	.64	.64
8' Spike Harrow (2-4' sections)	.5	.22	.11
2-Row Potato Planter and Fertilizer Attachment	1.1	3.00	3.30
12' Spike Harrow (3-4' sections)	.3	.32	.10
2-Row Cultivator	1.0	.09	.09
6' Steel Roller	.3	2.04	.61
Total Equipment			5.65

Continued-

Table 16 continued

Inputs	Units of Inputs per Acre (hours)	Cost per Unit of Input	Total Cost
Materials:			
Seed, dipped (cwt)	18.0	$ 5.00	$ 90.00
Water (Acre feet)	2.6	7.67	19.94
Fertilizer (lbs.) g/	825.0	.0266	21.95
Gypsum, refined (tons)	2.0	12.00	24.00
Dust (lbs.) h/	30.0	.0545	1.64
Gypsum, commercial (lbs.) i/	500.0	.006	3.00
Total Materials			160.53
Miscellaneous:			
Compensation Insurance j/			.15
Taxes			6.25
Interest (5% of $300)			15.00
Total Miscellaneous			21.40
Total Cost per Acre			$440.60
Total Cost per Cwt.			$ 1.52

a/ Usual piece work, the 1949-50 rate being $.25/cwt. Average worker can cut 29 cwt/9 hrs.

b/ Application charge only. Potatoes dug after June 15 would receive a second dusting, adding $2.84 per acre to the cost or about $.01 per sack.

c/ Usually contracted, the 1949-50 rate being $10.00/acre. Physical inputs approximate 1.5 tractor hrs. and machine hrs. and 3 man hrs.

d/ Usually contracted, the 1949-50 rate being $.14/cwt. ($.12 for the picker and $.02 for the contractor). In 10 hrs. the average picker will pick 80 cwt., requiring 36 man hrs. to pick an acre if the yield is 290 cwt.

e/ Varies with distance hauled. $2.00/ton represents an average hauling charge based on field survey data.

f/ Includes washing, grading, sacking, and loading for which the grower is charged $.50/cwt.

g/ 21% dry Ammonium Sulfate.

h/ 5% DDT, 50% Sulfur.

i/ Applied in the water.

j/ $1.10/$100 of payroll.

TABLE 17

Cost of Producing Potatoes on Farm V (320 Acres)
(Yield: 290 cwt. per acre)

Inputs	Units of Inputs per Acre (hours)	Cost per Unit of Input	Total Cost
Labor:			
Tractor Driver	4.7	$ 1.00	$ 4.70
Irrigator	8.6	.80	6.88
General	1.2	.80	.96
Total Labor			12.54
Contracted and Piece Work:			
Cutting Seed a/			4.50
Dusting b/			1.20
Rotobeating ($3.00/acre)			3.00
Digging c/			10.00
Picking d/			40.60
Hauling ($.10/cwt) e/			29.00
Shed Costs f/			145.00
Total Contracted and Piece Work			233.30
Motive Power:			
W-2	1.9	.60	1.14
W-3	2.2	1.14	2.51
DT-3	.6	2.69	1.61
Total Motive Power			5.26
Farm Equipment:			
8' Chisel	.6	.27	.16
2-Row Cultivator	1.0	.03	.03
4-Row Lister	.3	.54	.16
7' Offset Disk Harrow	1.0	.26	.26
2-Row Potato Planter and Fertilizer Attachment	1.2	1.54	1.85
12' Spike Harrow	.3	.11	.03
6' Steel Roller	.3	1.07	.32
Total Equipment			2.81

Continued-

Table 17 continued

Inputs	Units of Inputs per Acre (hours)	Cost per Unit of Input	Total Cost
Materials:			
Seed, dipped (cwt)	18.0	$ 5.00	$ 90.00
Water (Acre feet)	2.6	5.77	15.00
Fertilizer (lbs.) g/	825.0	.0266	21.95
Gypsum, refined (tons)	2.0	12.00	24.00
Dust (lbs.) h/	30.0	.0545	1.64
Gypsum, commercial (lbs.) i/	500.0	.006	3.00
Total Materials			155.59
Miscellaneous:			
Compensation Insurance j/			.17
Taxes			6.25
Interest (5% of $300)			15.00
Total Miscellaneous			21.42
Total Cost per Acre			$430.97
Total Cost per Cwt.			$ 1.49

a/ Usual piece work, the 1949-50 rate being $.25/cwt. Average worker can cut 29 cwt/9 hrs.

b/ Application charge only. Potatoes dug after June 15 would receive a second dusting, adding $2.84 per acre to the cost or about $.01 per sack.

c/ Usually contracted, the 1949-50 rate being $10.00/acre. Physical inputs approximate 1.5 tractor hrs. and machine hrs. and 3 man hrs.

d/ Usually contracted, the 1949-50 rate being $.14/cwt. ($.12 for the picker and $.02 for the contractor). In 10 hrs. the average picker will pick 80 cwt., requiring 36 man hrs. to pick an acre if the yield is 290 cwt.

e/ Varies with distance hauled. $2.00/ton represents an average hauling charge based on field survey data.

f/ Includes washing, grading, sacking, and loading for which the grower is charged $.50/cwt.

g/ 21% dry Ammonium Sulfate.

h/ 5% DDT, 50% Sulfur.

i/ Applied in the water.

j/ $1.10/$100 of payroll.

Inputs	Inputs per hour (hours)	Cost per unit of input	Total cost
Operating:			
Water (1,000 gal.)	2.6	$1.17	$3.04
Power (kw.) 1/	805.0	.006	4.83
Operator, salaried	2.0	12.00	24.00
Operator, common (hrs.) 2/	2.0	.84	1.68
Overhead, 50% of labor			12.84
Total operating			$46.39
Miscellaneous:			
Depreciation 3/			$ 1.67
Interest (5% of $300)			15.00
Total miscellaneous			$16.67
Total cost per acre			$63.06
Total cost per bale			$ 1.40

1/ Diesel pipe work, 1hp-50 rate being $.02/kwh. Average weather was dry during ginning, using 1K. 2/ per acre so the cost or about $.05 per bale.

approximate 1.5 tractor hrs. and machine hrs. and 3 man hrs.

4/ Usually consumed, the 1.0-50 rate being .04/acre. (5.12 the pick 50 cut., requiring 30 man hrs. to pick or acre if the yield is 200 or

5/ Varies with distance hauled. $2.00/bale represents an average hauling

3/ Includes ginning, marketing, and hauling for which the owner is

2/ [illegible]

1/ 5% Int., 50% bottom.

1/ Applied in the water.

1/ $1.10/$100 of payroll.

per acre and on the 320 acre farm (Farm V) it was only $430.97. The relatively large yield reduces the per sack differences to a few cents. The reasons for these declines and the source of savings are the same as for the cotton enterprise; namely, motive power and water costs. Motive power costs declined from $6.95 on the 80 acre farm to $5.26 on the 320 acre farm. Water costs declined from $20.16 to $15.00.

Effects of enterprise organization are not clear in these data largely because of counter shifts in cost elements. The cost per acre for potato production on Farm I is $439.00 and on Farm II it is $438.14. Again an advantage in motive power and equipment usage is nearly offset by the increased water cost which Farm II experienced because of the lack of alfalfa in the organization. Comparing Farms III and IV, both of 80 acres but with Farm IV double cropping milo behind potatoes, potato production costs on a per acre basis showed a difference of $3.37 with Farm IV enjoying the reduced cost. Better equipment and pumping plant utilization because of existing enterprise complementarity explains this difference. The statements with reference to choice of cost-price data in the assumptions underlying this analysis and the possible results to be obtained if other sets of data had been used are equally applicable in this section.

Cost differentials based on resource utilization which in turn reflects variation in organization do not in themselves provide a basis for farm reorganization. Any plan for reorganizing a farm must also consider the gross farm income changes which will accompany the reorganization. The object of reorganization is to increase net farm income, net farm income reflecting both gross income and cost changes arising from the alteration.

One further comment on these comparisons is necessary. The cost data shown indicate that scale economies exist on cotton-potato farms (Tables 8 through 17). But these calculations have included charges for only those amounts of resources necessary to produce the crops. Additional expenses accrue to the farm business when the productive resources at the disposal of the farm operator are not fully employed. The operator's own labor and that of his family are probably the best example of unemployed resources, particularly on smaller farms.

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Therefore, the strict budget technique employed in this section understates the actual cost differences occurring between the 80 acre and 320 acre farm.15/

Conclusions

The physical and biological limitations to agricultural production, the physical input-output data, cost and price assumptions, and cost of production calculations have been presented in this report for the primary purpose of assisting farm operators in making organization and management decisions. Other agencies interested in agricultural production in this area should also find this information helpful.

The physical information should be of value in selecting enterprises and combining them into an organization, in determining tractor power and equipment needs, in selecting adequate irrigating facilities, and in planning the farm work program to make most efficient use of the various resources at the disposal of the farm operator. Cost data, as developed in the final sections of this report are of value in making current organization decisions but the method employed in the computations is probably of greater value in providing the individual operator with a method for making calculations reflecting his individual conditions.

This report has presented a large quantity of background information on farming in this area. Subsequent reports will treat in greater detail the problems of scale of operations and the relation to costs and returns, and the more specific problem of production adjustments to changing costs and prices, acreage and marketing controls, and changing technology. These reports will illustrate specific adjustments in organization which can be made to maximize net farm incomes when economic and institutional forces affecting agricultural production in this area change.

15/ The second report in this series is devoted to an analysis of scale economies on cotton-potato farms in this area.

APPENDIX TABLE 1

Physical Resources Available to the Operator of Farm I,
a 160 Acre Farm Cultivating 80 Acres of Cotton,
30 Acres of Potatoes, and 40 Acres of Alfalfa

Physical Resources	Investment Per Unit	Total Investment
Land, 160 Acres	$ 300.	$ 48,000.
Buildings		
Dwelling	4,500.	
Tractor Shed	750.	
Shop-Storage Shed (Equipped) a/	1,565.	
		6,815.
Irrigation System		
900 G.P.M. Well and pump	7,015.	
700 G.P.M. Well and pump	4,600.	
Underground concrete system	7,122.	
		18,737.
Motive Power		
W-2 Tractor	1,485.	
DT-3 Tractor	2,990.	
		4,475.

Continued-

Appendix Table 1 continued.

Physical Resources	Investment Per Unit	Total Investment
Farm Equipment		
8'-Chisel	$ 305.	
10'-Cultipacker	210.	
2-Row Cultivator	180.	
2-Row Fertilizer Attachment	75.	
2-Row Lister	170.	
4-Row Lister Planter	405.	
7 1/2'-Offset Disk Harrow	385.	
2-Row Potato Planter and Fertilizer Attachment	570.	
7'-Power Mower	180.	
8'-Side Delivery Rake	315.	
12'-Spike Harrow	60.	
2-Row Stalk Cutter	95.	
6'-Steel Roller	115.	
		$ 3,065.
		$ 81,092.
Labor Force		
Operator b/		
1 man, full time for 8 1/2 months		

a/ A farm shop equipped with sufficient small tools to make adjustments and minor repairs on equipment, a drill press, and small arc welding outfit.

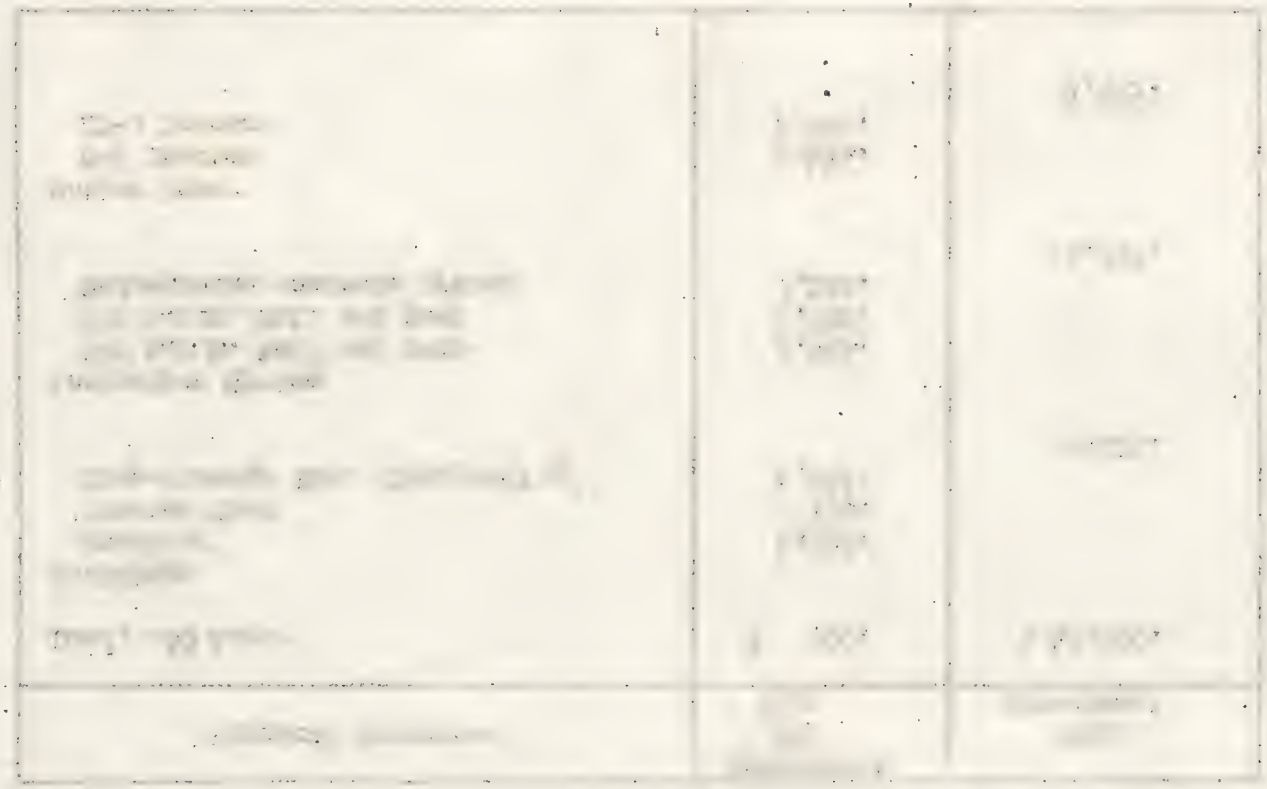
b/ Available full time at field work until May 10, half-time until cotton harvest completed, then full time for month of December.

APPENDIX TABLE 2

Physical Resources Available to the Operator of Farm II,
a 160 Acre Farm Cultivating 100 Acres of Cotton
and 50 Acres of Potatoes

Physical Resources	Investment Per Unit	Total Investment
Land, 160 Acres	$ 300.	$ 48,000.
Buildings		
Dwelling	4,500.	
Tractor Shed	750.	
Shop-Storage Shed (Equipped) a/	1,565.	
		6,815.
Irrigation System		
900 G.P.M. Well and pump	7,015.	
700 G.P.M. Well and pump	4,600.	
Underground concrete system	7,122.	
		18,737.
Motive Power		
W-2 Tractor	1,485.	
DT-3 Tractor	2,990.	
		4,475.

Continued-



Appendix Table 2 continued.

Physical Resources	Investment Per Unit	Total Investment
Farm Equipment		
8'-Chisel	$ 305.	
10'-Cultipacker	210.	
2-Row Cultivator	180.	
2-Row Fertilizer Attachment	75.	
2-Row Lister	170.	
4-Row Lister Planter	405.	
7 1/2'-Offset Disk Harrow	385.	
2-Row Potato Planter and Fertilizer Attachment	570.	
12'-Spike Harrow	60.	
2-Row Stalk Cutter	95.	
6' Steel Roller	115.	
		$ 2,570.
		$ 80,597.
Labor Force		
Operator b/		
1 man, full time for 6 months.		

a/ A farm shop equipped with sufficient small tools to make adjustments and minor repairs on equipment, a drill press, and small arc welding outfit.

b/ Available full time for field work until October 10, then half-time until December 7, then full time.

APPENDIX TABLE 3

Physical Resources Available to the Operator of Farm III, an 80 Acre Farm Cultivating 50 Acres of Cotton, 15 Acres of Potatoes, and 10 Acres of Alfalfa

Physical Resources	Investment Per Unit	Total Investment
Land, 80 Acres	$ 300.	$ 24,000.
Buildings		
Dwellings	4,500.	
Tractor Shed	400.	
Shop-Storage Shed a/	915.	
		5,815.
Irrigation System		
900 G.P.M. Well and pump	7,015.	
Underground concrete system	3,489.	
		10,504.
Motive Power		
W-3 Tractor	2,490.	
		2,490.

Continued-

Appendix Table 3 continued

Physical Resources	Investment Per Unit	Total Investment
Farm Equipment		
10'-Cultipacker	$ 210.	
2-Row Cultivator	180.	
2-Row Fertilizer Attachment	75.	
4-Row Lister	315.	
4-Row Lister Planter	405.	
7'-Offset Disk Harrow	341.	
2-Row Potato Planter and Fertilizer Attachment	570.	
2-16" (2-way) Plow	325.	
7'-Power Mower	180.	
8'-Side Delivery Rake	315.	
12'-Spike Harrow	60.	
2-Row Stalk Cutter	95.	
6' Steel Roller	115.	
		$ 3,186.
		$ 45,995.
Labor Force		
Operator Full Time		
Regular Hired Labor at Planting Times b/		

a/ Shop consists of bench and small tools needed for adjustment and minor repair of machinery. No welding equipment or power tools included.

b/ For a total time of 7.2 days.

APPENDIX TABLE 4

Physical Resources Available to the Operator of Farm IV, an 80 Acre Farm Cultivating 50 Acres of Cotton, 25 Acres of Potatoes, and 20 Acres of Milo Double-Cropped After Potatoes

Physical Resources	Investment Per Unit	Total Investment
Land, 80 Acres	$ 300.	$ 24,000.
Buildings		
Dwelling	4,500.	
Tractor Shed	400.	
Shop-Storage Shed a/	915.	
		5,815.
Irrigation System		
900 G.P.M. Well and pump	7,015.	
Underground concrete system	3,489.	
		10,504.
Motive Power		
W-3 Tractor	2,490.	
		2,490.

Continued-

Appendix Table 4 continued

Physical Resources	Investment Per Unit	Total Investment
Farm Equipment		
10'-Cultipacker	$ 210.	
2-Row Cultivator	180.	
2-Row Fertilizer Attachment	75.	
4-Row Lister	315.	
4-Row Lister Planter	405.	
7'-Offset Disk Harrow	341.	
2-Row Potato Planter and Fertilizer Attachment	570.	
2-16" (2-way) Plow	325.	
12'-Spike Harrow	60.	
2-Row Stalk Cutter	95.	
6' Steel Roller	115.	
		$ 2,691.
		$ 45,500.
Labor Force		
Operator Full Time		
Regular Hired Labor at Planting Time b/		

a/ Shop consists of bench and small tools needed for adjustment and minor repair of machinery. No welding equipment or power tools included.

b/ For a total time of 4.9 days.

APPENDIX TABLE 5

Physical Resources Available to the Operator of Farm V a 320 Acre Farm Cultivating 200 Acres of Cotton, 50 Acres of Potatoes, and 50 Acres of Alfalfa

Physical Resources	Investment Per Unit	Total Investment
Land, 320 Acres	$ 300.	$ 96,000.
Buildings		
Dwelling	6,000.	
Tractor Shed	1,100.	
Shop-Storage Shed (Equipped) a/	2,050.	
		9,150.
Irrigation System		
3-700 G.P.M. Wells and pumps	13,800.	
1-900 G.P.M. Well and pump	7,015.	
Underground concrete system b/	14,244.	
		35,059.
Motive Power		
W-2 Tractor	1,485.	
W-3 Tractor	2,490.	
DT-3 Tractor	2,990.	
		6,965.

Continued-

Appendix Table 5 continued

Physical Resources	Investment Per Unit	Total Investment
Farm Equipment		
8'-Chisel	$ 305.	
10'-Cultipacker	210.	
2- 2-Row Cultivators	360.	
2- 2-Row Fertilizer Attachments	150.	
4-Row Lister	315.	
4-Row Lister Planter	405.	
7'-Offset Disk Harrow	341.	
10'-Offset Disk Harrow	525.	
7'-Power Mower	180.	
2-Row Potato Planter and Fertilizer Attachment	570.	
8'-Side Delivery Rake	315.	
12'-Spike Harrow	60.	
2-Row Stalk Cutter	95.	
6' Steel Roller	115.	$ 3,946.
		$ 151,120.
Labor Force		
Operator c/		
1 man full time		
1 man part time d/		
1 irrigator e/		

a/ A farm shop equipped with an extensive set of small tools, some power driven equipment such as a drill press, an arc welding outfit and other tools required to make adjustments and repairs on equipment, limiting shop jobs to heavy welding and major overhaul.

b/ This system is twice that required on a farm of 160 acres. With less pumps and larger ones it might be possible to reduce this system but for the typical farm of this size, a system similar to this is comparable.

c/ Operator can work full time to March 1, half-time to May 10, then only as used in irrigating until time to start hauling cotton to the gin at which time he can be used for this task. On completing cotton harvest he is again available full time.

d/ For a total time of 185.4 days during the period from January through the 1st week in September.

e/ For a total time of 76.5 hours during the period from May 10 to September 10.

APPENDIX TABLE 6

Standard of Inputs and Outputs and Calendar of Operations for Cotton
(Per Acre Inputs Based on a Yield of 2.1 Bales and Typical of a 160-Acre Farm Unit)

Dates	Operations	Crew and Equipment				Acres per 9-hour day	Physical requirements	
		Men	Tractor	Truck	Equipment		Man-hours	Tractor hours
Dec.15-Jan.15	Cutting stalks	1	W-2		2-row stalk cutter	18.4	.5	.5
Dec.20-Jan.20	Disking (2 times)	1	DT-3		7 1/2' offset disk	18.5	1.0	1.0
Jan.10-Feb.10	Chiseling	1	DT-3		8' chisel	15.0	.6	.6
Feb.15-Mar.15	Furrowing out	1	W-2		2-row lister	18.7	.5	.5
Feb.20-Mar.20	Preirrigating (6 acre-in.)						1.9	
Mar.1-Apr.1	Harrowing down beds	1	W-2		12' spike harrow	28.1	.3	.3
Apr.1-Apr.15	Planting (30 lbs.delinted seed)	2	W-2		4-row lister planter	26.4	.6	.3
Apr.5-Apr.20	Cultipacking	1	W-2		10' cultipacker	33.1	.3	.3
Apr.25-May 5	Cultivating (1st)	1	W-2		2-row cultivator	13.5	.7	.7
May 1-May 20	Chopping			Contract			5.3	
May 5-May 20	Cultivating (2nd)	1	W-2		2-row cultivator	14.3	.6	.6
May 20-June 5	Cultivating (3rd) and fertilizing	1	W-2		2-row cultivator and fertilizer attachment	13.0	.7	.7
May 20-June 10	Irrigating,1st (4 acre-in.)						1.1	
May 25-June 15	Hoeing			Contract			3.8	
May 25-June 15	Cultivating (4th)	1	W-2		2-row cultivator	16.3	.6	.6
June 15-June 30	Irrigating,2nd (4 acre-in.)						1.1	
June 20-July 5	Cultivating (5th)	1	W-2		2-row cultivator	16.3	.6	.6
July 1-July 10	Irrigating,3rd (4 acre-in.)						1.0	
July 1-July 15	Dusting (60 lbs.-5% DDT-50% sulfur)			Contract				
July 5-July 15	Cultivating (6th)	1	W-2		2-row cultivator	16.3	.6	.6
July 15-July 25	Irrigating,4th (4 acre-in.)						.8	
July 25-Aug.5	Irrigating,5th (4 acre-in.)						.7	
July 30-Aug.5	Cultivating (7th)	1	W-2		2-row cultivator	16.3	.6	.6
Aug.1 to Sept.10	Irrigating,continuous (12.4 acre-in.)						3.5	
Sept.1-Sept.25	Defoliating			Contract				
Sept.15-on	First picking, hand (88.2 man hours)			Contract				
Nov.15-on	Second picking, hand							
Sept.15-on	Hauling to gin				Pickup and 5-bale cotton trailer		1.0	
	Ginning			Contract				
TOTALS							27.4 a/	7.9

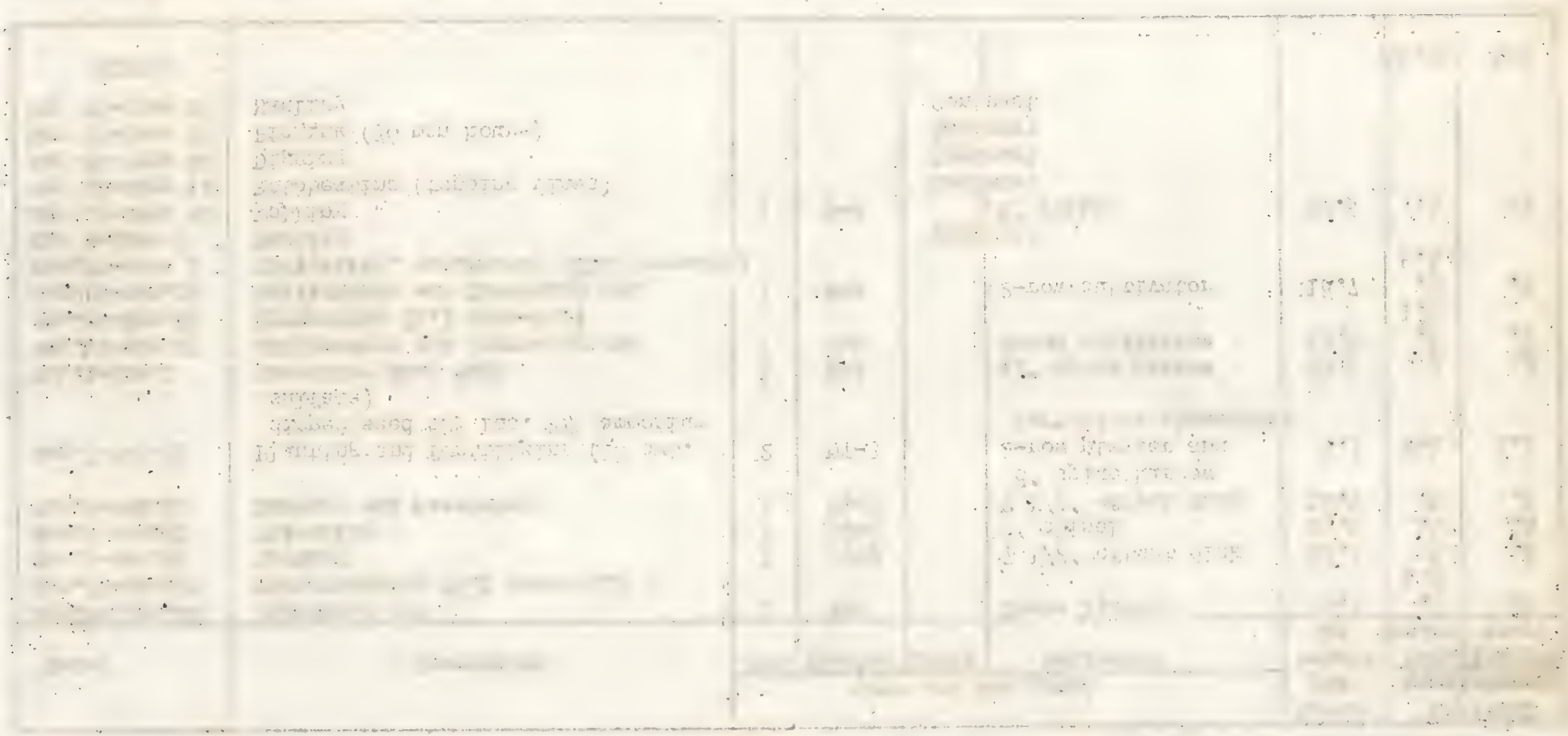
a/ Plus 88.2 man-hours picking labor.

APPENDIX TABLE 7

Standard of Inputs and Outputs and Calendar of Operations for Potatoes
(Per Acre Inputs Based on a Yield of 290 Cwt. and Typical of a 160-Acre Farm Unit)

Dates	Operations	Crew and Equipment				Acres per 9-hour day	Physical requirements	
		Men	Tractor	Truck	Equipment		Man-hours	Tractor hours
Dec.20-Jan.20	Furrowing out	1	W-2		2-row lister	18.7	.5	.5
Dec.20-Jan.20	Preirrigating (5.1 acre-in.)						1.8	
Jan.1-Jan.30	Disking	1	DT-3		7 1/2' offset disk	18.5	.5	.5
Jan.5-Jan.25	Chiseling	1	DT-3		8' chisel	15.0	.6	.6
Jan.5-Feb.10	Disking and harrowing	1	DT-3		7 1/2' offset disk, 8' spike harrow	18.5	.5	.5
Jan.5-Feb.15	Planting and fertilizing (18 cwt. dipped seed 825 lbs. 21% ammonium sulfate)	2	DT-3		2-row planter and fertilizer attachment	7.3	2.4	1.2
Feb.1-Mar.1	Harrowing down beds	1	W-2		12' spike harrow	28.1	.3	.3
Feb.15-Mar.15	Cultivating and furrowing out	1	W-2		2-row cultivator	17.6	.5	.5
Feb.20-Mar.20	Irrigating (4.3 acre-in.)						1.2	
Mar.10-Mar.30	Cultivating and furrowing out	1	W-2		2-row cultivator	18.7	.5	.5
Mar.20-June 1	Irrigating, continuous (20.6 acre-in.)						5.6	
May 5-June 5	Dusting			Contract				
May 15-June 10	Rolling	1	W-2		6' roller	30.5	.3	.3
May 15-June 10	Rotobeating (topping vines)			Contract				
May 20-June 20	Digging			Contract				
May 20-June 20	Picking (36 man hours)			Contract				
May 20-June 20	Hauling			Contract				
TOTALS							14.7a/	4.9

a/ Plus 5.6 man-hours for cutting seed and 36 man-hours picking labor.



APPENDIX TABLE 8

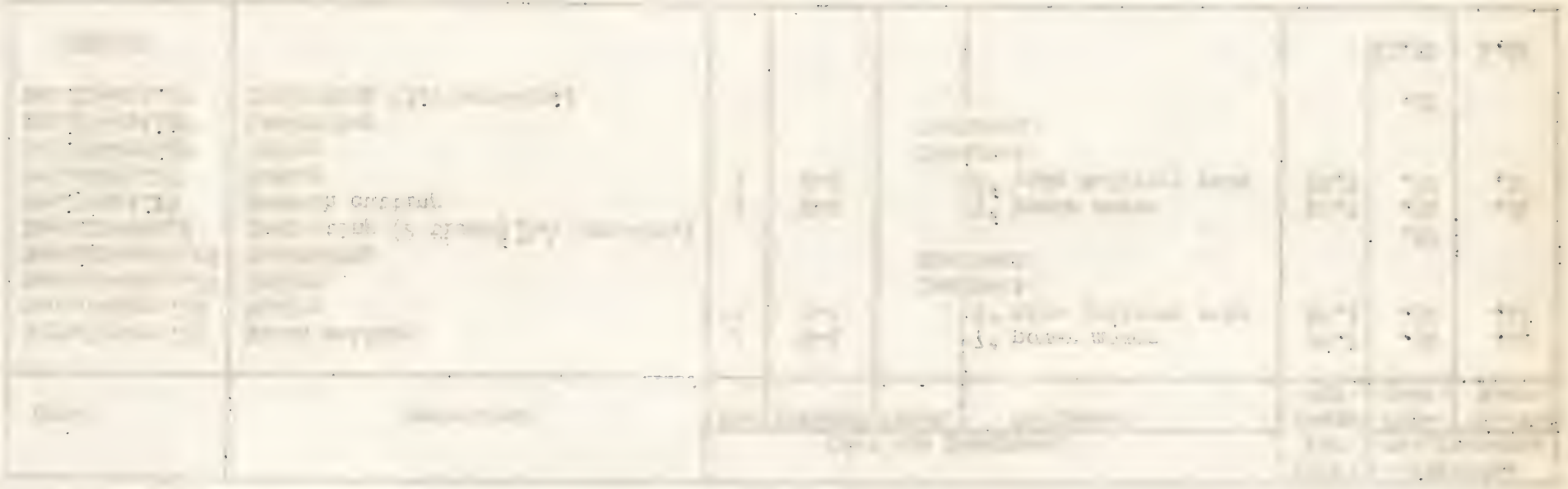
Standard of Inputs and Outputs and Calendar of Operations for Alfalfa
(Per Acre Inputs Based on a Yield of 8.5 Tons and Typical of a 160-Acre Farm Unit)

Dates	Operations	Crew and Equipment				Acres per 9-hour day	Physical requirements	
		Men	Tractor	Truck	Equipment		Man-hours	Tractor hours
Mar.5-Mar.25	Irrigating (4.2 acre-in.)						.74	
Apr.5-Apr.15	First cutting	1	W-2		7' power mower	26.7	.34	.34
Apr.6-Apr.16	Raking	1	W-2		8' side delivery rake	28.3	.32	.32
Apr.10-Apr.20	Baling			Contract				
Apr.10-Apr.20	Roadsiding			Contract				
Apr.12-May 5	Irrigating (2 times) (7.4 acre-in.)						.62	
May 5-May 15	Second cutting	1	W-2		7' power mower	26.7	.34	.34
May 6-May 16	Raking	1	W-2		8' side delivery rake	28.3	.32	.32
May 10-May 20	Baling			Contract				
May 10-May 20	Roadsiding			Contract				
May 12-June 5	Irrigating (2 times) (7.4 acre-in.)						.62	
June 5-June 15	Third cutting	1	W-2		7' power mower	26.7	.34	.34
June 6-June 16	Raking	1	W-2		8' side delivery rake	28.3	.32	.32
June 10-June 20	Baling			Contract				
June 10-June 20	Roadsiding			Contract				
June 12-July 5	Irrigating (3 times) (11.1 acre-in.)						.93	
July 5-July 15	Fourth cutting	1	W-2		7' power mower	26.7	.34	.34
July 6-July 16	Raking	1	W-2		8' side delivery rake	28.3	.32	.32
July 10-July 20	Baling			Contract				
July 10-July 20	Roadsiding			Contract				
July 12-Aug.5	Irrigating (3 times) (11.1 acre-in.)						.93	
Aug.5-Aug.15	Fifth cutting	1	W-2		7' power mower	26.7	.34	.34
Aug.6-Aug.16	Raking	1	W-2		8' side delivery rake	28.3	.32	.32
Aug.10-Aug.20	Baling			Contract				
Aug.10-Aug.20	Roadsiding			Contract				
Aug.12-Sept.5	Irrigating (3 times) (11.1 acre-in.)						.93	

Continued-

Appendix Table 8 continued

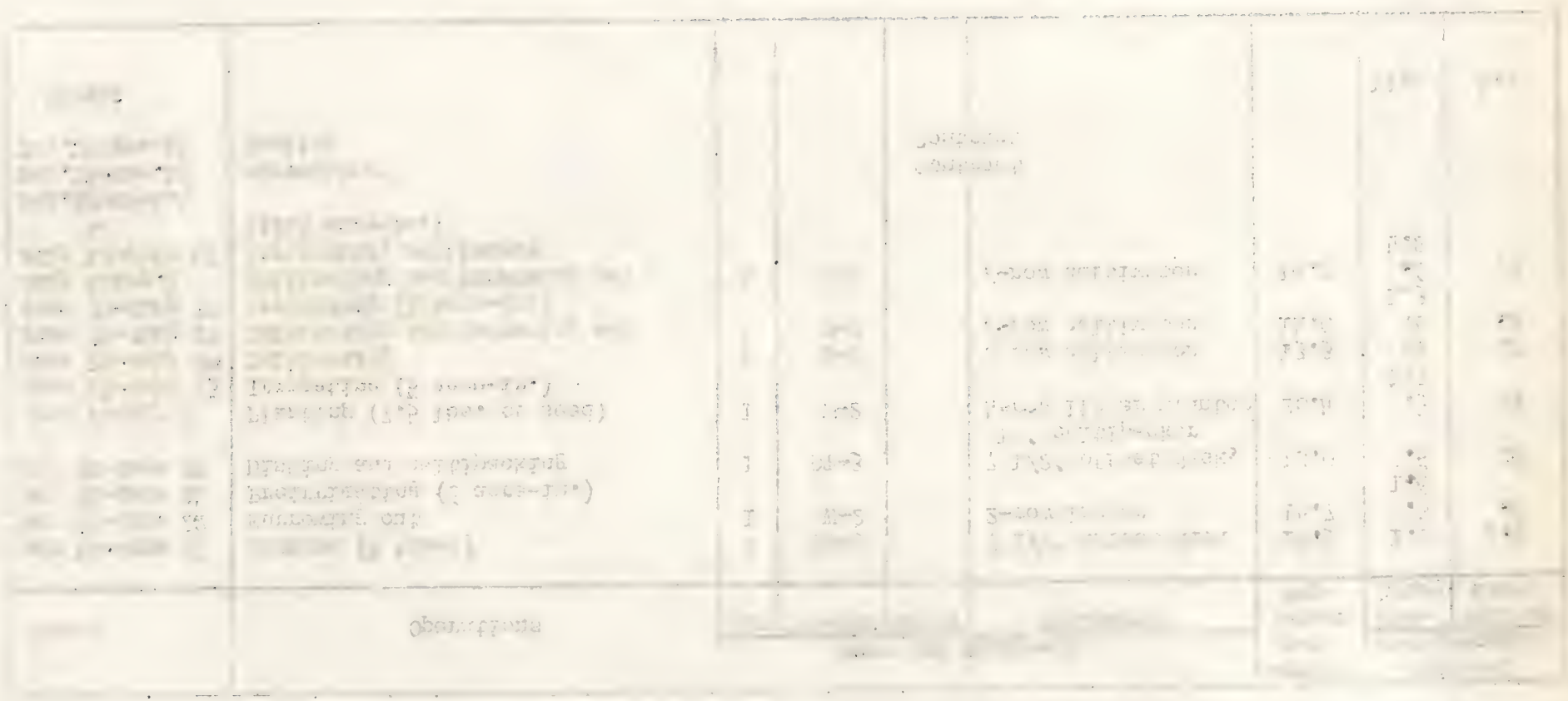
Dates	Operations	Crew and Equipment				Acres per 9-hour day	Physical requirements	
		Men	Tractor	Truck	Equipment		Man-hours	Tractor hours
Sept.5-Sept.15	Sixth cutting	1	W-2		7′ power mower	26.7	.34	.34
Sept.6-Sept.16	Raking	1	W-2		8′ side delivery rake	28.3	.32	.32
Sept.10-Sept.20	Baling			Contract				
Sept.10-Sept.20	Roadsiding			Contract				
Sept.12-Oct.5	Irrigating (2 times)(7.4 acre-in.)						.62	
Oct.5-Oct.15	Seventh cutting	1	W-2		7′ power mower	26.7	.34	.34
Oct.6-Oct.16	Raking	1	W-2		8′ side delivery rake	28.3	.32	.32
Oct.10-Oct.20	Baling			Contract				
Oct.10-Oct.20	Roadsiding			Contract				
Oct.12-Oct.30	Irrigating (3.7 acre-in.)						.31	
TOTALS							10.32	4.62



APPENDIX TABLE 9

Standard of Inputs and Outputs and Calendar of Operations for Milo
(Per Acre Inputs Based on a Yield of 2 Tons and Typical of a 160-Acre Farm Unit)

Dates	Operations	Crew and Equipment				Acres per 9-hour day	Physical requirements	
		Men	Tractor	Truck	Equipment		Man-hours	Tractor hours
May 15-June 15	Disking (2 times)	1	DT-3		7 1/2' offset disk	18.5	1.0	1.0
May 22-June 22	Furrowing out	1	W-2		2-row lister	18.7	.5	.5
May 24-June 24	Preirrigating (6 acre-in.)						1.6	
May 30-June 30	Disking and cultipacking	1	DT-3		7 1/2' offset disk, 10' cultipacker	18.0	.5	.5
June 1-July 1	Planting (7.5 lbs. of seed)	1	W-2		4-row lister planter	26.4	.3	.3
June 15-July 15	Irrigating (5 acre-in.)						1.7	
June 20-July 20	Cultivating	1	W-2		2-row cultivator	13.3	.7	.7
June 28-July 28	Cultivating and furrowing out	1	W-2		2-row cultivator	14.0	.6	.6
June 30-July 30	Irrigating (4 acre-in.)						1.3	
July 5-Aug.5	Cultivating and furrowing out	1	W-2		2-row cultivator	14.0	.6	.6
July 10-July 15 to Aug.30-Sept.5	Irrigating, continuous (12.6 acre-in.)						4.2	
Oct.15-Nov.15	Harvesting			Contract				
Oct.15-Nov.15	Hauling			Contract				
TOTALS							13.0	4.2



APPENDIX TABLE 10

Standard of Inputs and Outputs and Calendar of Operations for Barley
(Per Acre Inputs Based on a Yield of 20 Cwt. and Typical of a 160-Acre Farm Unit)

Dates	Operations	Crew and Equipment				Acres per 9-hour day	Physical requirements	
		Men	Tractor	Truck	Equipment		Man-hours	Tractor hours
Dec.10-Jan.10	Disking (2 times)	1	DT-3		7 1/2' offset disk	18.5	1.0	1.0
Dec.20-Jan.20	Seeding (72.5 lbs.treated seed)	1	W-2		Broadcaster	37.7	.2	.2
Dec.20-Jan.20	Bordering up	1	W-2		Borderer	39.4	.2	.2
Feb.1-Mar.1	Irrigating (6.5 acre-in.)						.9	
Mar.1-Apr.1	Irrigating (6.4 acre-in.)						.8	
Apr.1-May 1	Irrigating (6.3 acre-in.)						.7	
June 1-July 1	Harvesting			Contract				
June 1-July 1	Hauling			Contract				
TOTALS							3.8	1.4

APPENDIX TABLE 11

Standard of Inputs and Outputs and Calendar of Operations for Sugar Beets
(Per Acre Inputs Based on a Yield of 18 Tons and Typical of a 160-Acre Farm Unit)

Dates	Operations	Crew and Equipment				Acres per 9-hour day	Physical requirements	
		Men	Tractor	Truck	Equipment		Man-hours	Tractor hours
Dec.15-Feb.1	Chiseling	1	DT-3		8' chisel	15.0	.6	.6
Jan.15-Feb.15	Disking (2 times)	1	DT-3		7 1/2' offset disk	18.5	1.0	1.0
Jan.25-Feb.25	Bedding up	1	W-2		2-row lister	18.7	.5	.5
Feb.1-Mar.1	Planting (5 lb. seed)	1	W-2		4-row planter (rented from sugar company)	12.0	.8	.8
Feb.15-Mar.15	Irrigating (6.5 acre-in.)						.5	
Feb.25-Mar.25	Cultivating	1	W-2		2-row cultivator	10.0	.9	.9
Mar.10-Apr.10	Irrigating (6.5 acre-in.)						.3	
Mar.15-Apr.15	Thinning			Contract			14.0	
Mar.20-Apr.20	Irrigating (6.5 acre-in.)						.25	
Mar.25-Apr.25	Cultivating and side-dressing (375 lbs.fertilizer--21% ammonium sulphate dry)	1	W-2		2-row cultivator with fertilizer attachment	13.0	.7	.7
Apr.1-May 1	Irrigating (6.5 acre-in.)						.25	
Apr.10-May 10	Weeding			Contract			12.0	
Apr.25-May 25	Cultivating and furrowing out	1	W-2		2-row cultivator	17.0	.5	.5
May 1-June 15	Irrigating (2 times) (13 acre-in.)						.5	
May 15-June 15	Cultivating	1	W-2		2-row cultivator	20.0	.5	.5
June 1-July 1 to July 20-Aug.20	Irrigating (5 times) (33 acre-in.)						1.3	
July 25-Aug.25	Plowing in ditches	1	W-2		2-16" 2-way plow	80.0	.1	.1
Aug.1-Sept.1	Harvesting	2			1-row (rented from sugar company)	6.0	3.0	1.5
Aug.1-Sept.1	Hauling			Contract				
TOTALS							37.7	7.1

APPENDIX TABLE 12

Standard of Inputs and Outputs and Calendar of Operations for Onions
(Per Acre Inputs Based on a Yield of 300 Cwt. and Typical of a 160-Acre Farm Unit)

Dates	Operations	Crew and Equipment				Acres per 9-hour day	Physical requirements	
		Men	Tractor	Truck	Equipment		Man-hours	Tractor hours
Aug.1-Oct.15	Disking and harrowing	1	DT-3		7 1/2' offset disk and 8' spike harrow	18.5	1.0	1.0
Sept.28-Oct.28	Furrowing out	1	W-2		2-row lister	18.7	.5	.5
Sept.29-Oct.29	Preirrigating (5 acre-in.)						1.6	
Oct.12-Nov.12	Cultivating, forming beds and fertilizing	1	W-2		2-row potato planter	9.0	1.0	1.0
Oct.15-Nov.15	Planting (3 lbs. of seed)	2	W-2		4-planet jr.seeder (rented)	12.0	1.6	.8
Oct.17-Nov.17	Irrigating (4 acre-in.)						1.4	
Nov. 1-Dec.1	Cultivating	1	W-2		2-row cultivator	10.0	.9	.9
Nov.6-Dec.6	Irrigating (4 acre-in.)						1.3	
Nov.15-Dec.15	Cultivating	1	W-2		2-row cultivator	13.0	.7	.7
Dec.15-Jan.15	Irrigating (4 acre-in.)						1.3	
Jan.1-Feb.1	Hand weeding						13.0	
Jan.10-Feb.10	Cultivating	1	W-2		2-row cultivator	17.0	.5	.5
Jan.25-Feb.25	Spraying (15 gal.material)			Contract				
Feb.15-Mar.15	Irrigating (3 acre-in.)						1.1	
Mar.1-Apr.1	Hand weeding						11.0	
Mar.3-Apr.3	Irrigating (2 acre-in.)						.7	
Mar.15-Apr.15	Irrigating (2 acre-in.)						.7	
Mar.20-Apr.20	Spraying (15 gal.material)			Contract				
Mar.25-Apr.25	Irrigating (2 acre-in.)						.7	
Apr.4-May 4	Irrigating (2 acre-in.)						.7	
Apr.5-May 5	Dusting (25 lbs.5% DDT,50% sulfur)			Contract				
Apr.14-May 14	Irrigating (2 acre-in.)						.7	
Apr.24-May 24	Irrigating (2 acre-in.)						.7	
May 15-June 15	Pulling,topping,sacking (150 man-hours)			Contract				
	Hauling			Contract				
TOTALS							41.1 a/	5.4

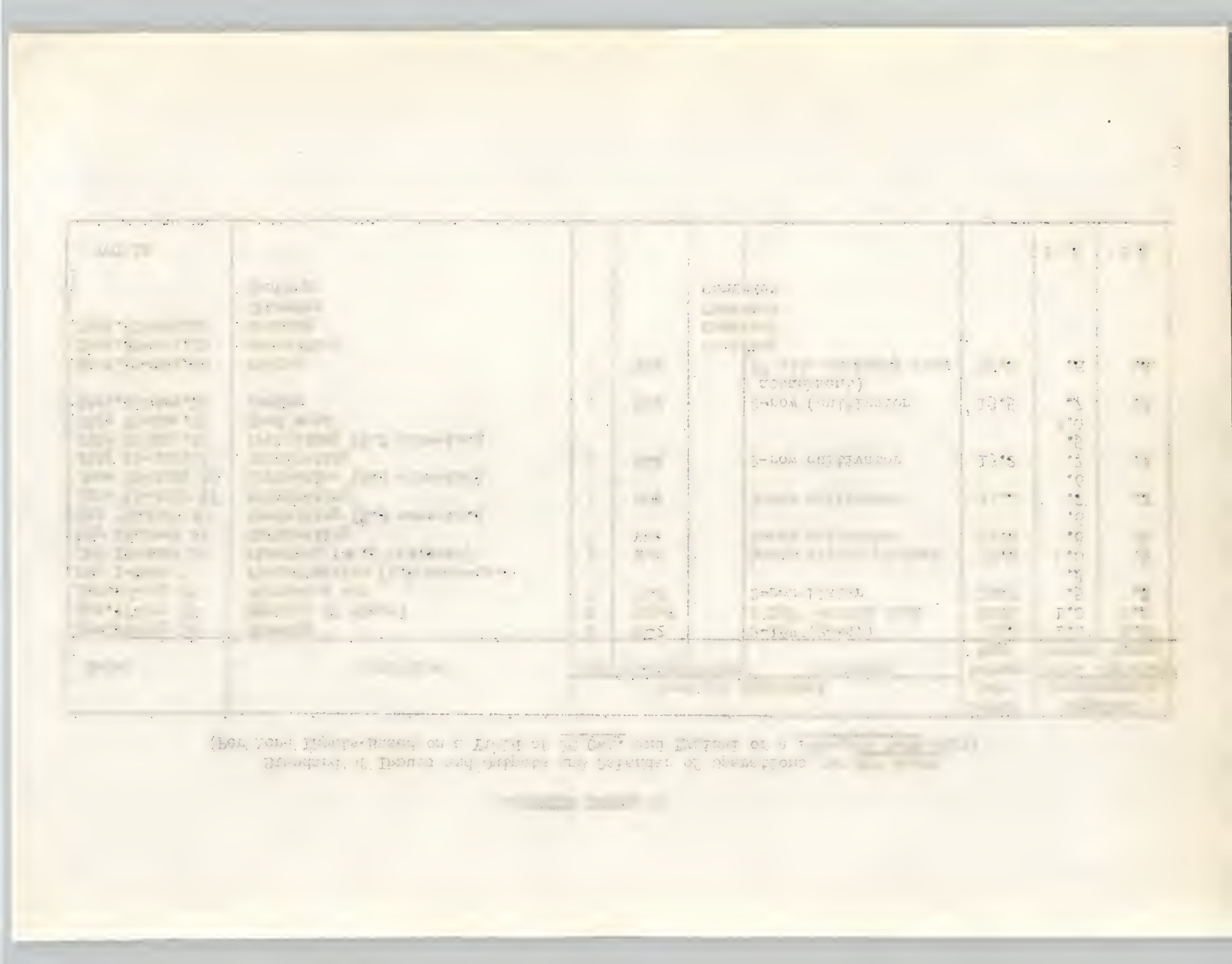
a/ Plus 150 man-hours hand harvest labor.

| | | |

APPENDIX TABLE 13

Standard of Inputs and Outputs and Calendar of Operations for Dry Beans
(Per Acre Inputs Based on a Yield of 20 Cwt. and Typical of a 160-Acre Farm Unit)

Dates	Operations	Crew and Equipment				Acres per 9-hour day	Physical requirements	
		Men	Tractor	Truck	Equipment		Man-hours	Tractor hours
Apr.10-May 10	Plowing	1	W-2		2-16" (2-way)	9.3	1.0	1.0
Apr.15-May 15	Disking (2 times)	1	DT-3		7 1/2' offset disk	18.5	1.0	1.0
Apr.25-May 25	Furrowing out	1	W-2		2-row lister	18.7	.5	.5
May 1-June 1	Preirrigating (7.0 acre-in.)						.8	
May 10-June 10	Planting (27.5 lbs.seed)	2	W-2		4-row lister planter	20.0	1.0	.5
May 25-June 25	Cultivating	1	W-2		2-row cultivator	11.0	.8	.8
May 30-June 30	Irrigating (5.3 acre-in.)						.6	
June 15-July 15	Cultivating	1	W-2		2-row cultivator	13.2	.7	.7
June 20-July 20	Irrigating (5.3 acre-in.)						.6	
July 15-Aug.15	Cultivating	1	W-2		2-row cultivator	13.2	.7	.7
July 20-Aug.20	Irrigating (5.2 acre-in.)						.5	
July 25-Aug.25	Hand weed						8.0	
Sept.20-Oct.20	Mowing	1	W-2		2-row (cultivator attachment)	13.5	.7	.7
Sept.20-Oct.20	Raking	1	W-2		8' side delivery rake	15.0	.6	.6
Sept.30-Oct.30	Harvesting			Contract				
Sept.30-Oct.30	Hauling			Contract				
	Cleaning			Contract				
	Sacking			Contract				
TOTALS							17.5	6.5



APPENDIX TABLE 14

Standard of Inputs and Outputs and Calendar of Operations for Safflower
(Per Acre Inputs Based on a Yield of 3,000 Pounds and Typical of a 160-Acre Farm Unit)

Dates	Operations	Crew and Equipment				Acres per 9-hour day	Physical requirements	
		Men	Tractor	Truck	Equipment		Man-hours	Tractor hours
Nov.1-Nov.15	Disking	1	DT-3		7 1/2' offset disk	18.5	.5	.5
Nov.7-Nov.22	Furrowing out	1	W-2		2-row lister	18.7	.5	.5
Nov.15-Dec.1	Preirrigating (6 acre-in.)						1.6	
Nov.20-Dec.5	Disking and harrowing	1	DT-3		7 1/2' offset disk, 8' spike harrow	18.5	.5	.5
Dec.3-Dec.18	Furrowing out	1	W-2		2-row lister	18.7	.5	.5
Dec.10-Dec.25	Planting (20 lbs.of seed)	2	W-2		4 planet jr.(rented)	12.0	1.6	.8
Feb.10-Feb.20	Irrigating (6 acre-in.)						1.7	
Mar.1-Mar.10	Cultivating and fertilizing (300 lbs.-21% ammonium sulfate dry)	1	W-2		2-row cultivator and fertilizer attachment	13.0	.7	.7
Mar.10-Mar.20	Irrigating (6 acre-in.)						1.2	
Apr.1-Apr.10	Cultivating	1	W-2		2-row cultivator	14.3	.6	.6
Apr.10-Apr.20	Irrigating (6 acre-in.)						1.2	
May 1-May 10	Cultivating	1	W-2		2-row cultivator	16.3	.6	.6
May 10-May 20	Irrigating (6 acre-in.)						1.2	
May 25-May 30	Cultivating	1	W-2		2-row cultivator	16.3	.6	.6
July 10-July 25	Harvesting			Contract				
July 10-July 25	Hauling			Contract				
TOTALS							13.0	5.3

APPENDIX TABLE 15

Standard of Inputs and Outputs and Calendar of Operations for Castor Beans
(Per Acre Inputs Based on a Yield of 2,500 Pounds and Typical of a 160-Acre Farm Unit)

Dates	Operations	Crew and Equipment				Acres per 9-hour day	Physical requirements	
		Men	Tractor	Truck	Equipment		Man-hours	Tractor hours
Jan.15-Mar.1	Disking (2 times)	1	DT-3		7 1/2' offset disk	18.5	1.0	1.0
Mar.10-Mar.25	Furrowing out	1	W-2		4-row lister	18.7	.5	.5
Mar.15-Mar.30	Preirrigating (5 acre-in.)						1.5	
Mar.30-Apr.15	Planting and fertilizing (12 lbs. treated seed--200 lbs.--21% ammonium sulphate dry)	2	W-2		Ventura-type bean planter	15.0	1.2	.6
Apr.25-May 10	Cultivating	1	W-2		2-row cultivator	12.0	.8	.8
May 5-May 20	Irrigating (4 acre-in.)						1.5	
May 15-May 30	Cultivating	1	W-2		2- row cultivator	15.0	.6	.6
May 20-June 5	Irrigating (4 acre-in.)						1.4	
June 5-June 20	Irrigating (4 acre-in.)						1.0	
June 20-July 5	Irrigating (4 acre-in.)						.9	
July 5-July 20	Irrigating (4 acre-in.)						.9	
July 20-Aug.5	Irrigating (4 acre-in.)						.9	
Aug.5-Aug.20	Irrigating (4 acre-in.)						.9	
Sept.15-Sept.30	Combining and hulling			Contract				
Sept.15-Sept.30	Hauling			Contract				
TOTALS							13.1	3.5

APPENDIX TABLE 16

Standard of Inputs and Outputs and Calendar of Operations for Field Corn a/
(Per Acre Inputs Based on a Yield of 2,500 Pounds of Shelled Corn and Typical of a 160-Acre Farm Unit)

Dates	Operations	Crew and Equipment				Acres per 9-hour day	Physical requirements	
		Men	Tractor	Truck	Equipment		Man-hours	Tractor hours
June 1-June 10	Disking	1	DT-3		7 1/2' offset disk	18.5	.5	.5
June 1-June 10	Furrowing out	1	W-2		2-row lister	18.7	.5	.5
June 5-June 15	Preirrigating (7.2 acre-in.)						1.4	
June 20-July 1	Planting (8 lbs.of seed)	1	W-2		4-row lister planter	20.0	.5	.5
June 25-July 6	Irrigating (4.0 acre-in.)						1.5	
July 2-July 13	Irrigating (4.0 acre-in.)						1.2	
July 10-July 20	Cultivating	1	W-2		2-row cultivator	11.0	.8	.8
July 12-July 22	Irrigating (4.0 acre-in.)						1.0	
July 22-Aug.1	Cultivating and fertilizing (300 lbs.-21% ammonium sulfate dry)	1	W-2		2-row cultivator with fertilizer attachment	15.0	.6	.6
July 24-Aug.3	Irrigating (4.0 acre-in.)						1.0	
July 31-Aug.10	Cultivating	1	W-2		2-row cultivator	11.0	.8	.8
Aug.2-Aug.12	Irrigating (4.0 acre-in.)						1.0	
Aug.9-Aug.19	Irrigating (4.0 acre-in.)						.9	
Aug.16-Aug.26	Irrigating (4.0 acre-in.)						.9	
Aug.23-Sept.3	Irrigating (4.0 acre-in.)						.8	
Aug.30-Sept.10	Irrigating (4.0 acre-in.)						.8	
b/	Picking and hauling			Contract				
	Shelling			Contract				
TOTALS							14.2	3.7

a/ Operations planned for double cropping after potatoes.

b/ Picking delayed until after frost (usually November 15 or later).

APPENDIX TABLE 17

Standard of Inputs and Outputs and Calendar of Operations for Cotton
(Per Acre Inputs Based on a Yield of 2.1 Bales and Typical of an 80-Acre Farm Unit)

Dates	Operations	Crew and Equipment				Acres per 9-hour day	Physical requirements	
		Men	Tractor	Truck	Equipment		Man-hours	Tractor hours
Dec.15-Jan.15	Cutting stalks	1	W-3		2-row stalk cutter	20.4	.4	.4
Dec.20-Jan.20	Disking (2 times)	1	W-3		7' offset disk	18.5	1.0	1.0
Jan.10-Feb.20	Plowing	1	W-3		2-16" (2-way)	9.3	1.0	1.0
Feb.15-Mar.15	Furrowing out	1	W-3		4-row lister	28.9	.3	.3
Feb.20-Mar.20	Preirrigating (6 acre-in.)						2.7	
Mar.1-Apr.1	Harrowing down beds	1	W-3		12' spike harrow	30.1	.3	.3
Apr.1-Apr.15	Planting (30 lbs.delinted seed)	2	W-3		4-row lister planter	26.4	.6	.3
Apr.5-Apr.20	Cultipacking	1	W-3		10' cultipacker	33.1	.3	.3
Apr.25-May 5	Cultivating (1st)	1	W-3		2-row cultivator	13.5	.7	.7
May 1-May 20	Chopping			Contract			5.3	
May 5-May 20	Cultivating (2nd)	1	W-3		2-row cultivator	14.3	.6	.6
May 20-June 5	Cultivating (3rd) fertilizing (325 lbs.fertilizer-21% ammonium sulfate dry)	1	W-3		2-row cultivator and fertilizer attachment	13.0	.7	.7
May 20-June 10	Irrigating, 1st (4 acre-in.)						1.4	
May 25-June 15	Hoeing			Contract			3.8	
May 25-June 15	Cultivating (4th)	1	W-3		2-row cultivator	16.3	.6	.6
June 15-June 30	Irrigating, 2nd (4 acre-in.)						1.3	
June 20-July 5	Cultivating (5th)	1	W-3		2-row cultivator	16.3	.6	.6
July 1-July 10	Irrigating, 3rd (4 acre-in.)						1.2	
July 1-July 15	Dusting (60 lbs.5% DDT-50% sulfur)			Contract				
July 5-July 15	Cultivating (6th)	1	W-3		2-row cultivator	16.3	.6	.6
July 15-July 25	Irrigating, 4th (4 acre-in.)						1.1	
July 25-Aug.5	Irrigating, 5th (4 acre-in.)						.9	
July 30-Aug.5	Cultivating (7th)	1	W-3		2-row cultivator	16.3	.6	.6
Aug.1-Sept.10	Irrigating,continuous (12.4 acre-in.)						3.9	
Sept.1-Sept.25	Defoliating			Contract				
Sept.15-on	First picking, hand (88.2 man hours)			Contract				
Nov.15-on	Second picking, hand							
Sept.15-on	Hauling to gin				Pickup and 5-bale cotton trailer		1.0	
TOTALS							30.9	a/ 8.0

a/ Plus 88.2 man-hours picking labor.

APPENDIX TABLE 18

Standard of Inputs and Outputs and Calendar of Operations for Potatoes
(Per Acre Inputs Based on a Yield of 290 Cwt. and Typical of an 80-Acre Farm Unit)

Dates	Operations	Crew and Equipment				Acres per 9-hour day	Physical requirements	
		Men	Tractor	Truck	Equipment		Man-hours	Tractor hours
Dec.20-Jan.20	Furrowing out	1	W-3		4-row lister	28.9	.3	.3
Dec.20-Jan.20	Preirrigating (5.1 acre-in.)						1.8	
Jan.1-Jan.30	Disking	1	W-3		7' offset disk	18.5	.5	.5
Jan.5-Jan.25	Plowing	1	W-3		2-16" (2-way)	9.3	1.0	1.0
Jan.15-Feb.10	Disking and harrowing	1	W-3		7' offset disk, 8' spike harrow	15.7	.5	.5
Jan.15-Feb.15	Planting and fertilizing (18 cwt. dipped seed,825 lbs.21% ammonium sulfate)	2	W-3		2-row planter and fertilizer attachment	8.2	2.2	1.1
Feb.1-Mar.1	Harrowing down beds	1	W-3		12' spike harrow	30.1	.3	.3
Feb.15-Mar.15	Cultivating and furrowing out	1	W-3		2-row cultivator	17.6	.5	.5
Feb.20-Mar.20	Irrigating (4.3 acre-in.)						1.3	
Mar.10-Mar.30	Cultivating and furrowing out	1	W-3		2-row cultivator	18.7	.5	.5
Mar.20-June 1	Irrigating,continuous (20.6 acre-in.)						6.2	
May 5-June 5	Dusting			Contract				
May 15-June 10	Rolling	1	W-3		6' roller	30.5	.3	.3
May 15-June 10	Rotobeating (topping vines)			Contract				
May 20-June 20	Digging			Contract				
May 20 June 20	Picking (36 man-hours)			Contract				
May 20-June 20	Hauling			Contract				
TOTALS							13.6	a/ 5.0

a/ Plus 5.6 man-hours for cutting seed and 36 man-hours picking labor.

APPENDIX TABLE 19

Standard of Inputs and Outputs and Calendar of Operations for Alfalfa
(Per Acre Inputs Based on a Yield of 8.5 Tons and Typical of an 80-Acre Farm Unit)

Dates	Operations	Crew and Equipment				Acres per 9-hour day	Physical requirements	
		Men	Tractor	Truck	Equipment		Man-hours	Tractor hours
Mar.5-Mar.25	Irrigating (4.2 acre-in.)						.74	
Apr.5-Apr.15	First cutting	1	W-3		7′ power mower	26.7	.34	.34
Apr.6-Apr.16	Raking	1	W-3		8′ side delivery rake	28.3	.32	.32
Apr.10-Apr.20	Baling			Contract				
Apr.10-Apr.20	Roadsiding			Contract				
Apr.12-May 5	Irrigating (2 times) (7.4 acre-in.)						.62	
May 5-May 15	Second cutting	1	W-3		7′ power mower	26.7	.34	.34
May 6-May 16	Raking	1	W-3		8′ side delivery rake	28.3	.32	.32
May 10-May 20	Baling			Contract				
May 10-May 20	Roadsiding			Contract				
May 12-June 5	Irrigating (2 times) (7.4 acre-in.)						.62	
June 5-June 15	Third cutting	1	W-3		7′ power mower	26.7	.34	.34
June 6-June 16	Raking	1	W-3		8′ side delivery rake	28.3	.32	.32
June 10-June 20	Baling			Contract				
June 10-June 20	Roadsiding			Contract				
June 12-July 5	Irrigating (3 times) (11.1 acre-in.)						.93	
July 5-July 15	Fourth cutting	1	W-3		7′ power mower	26.7	.34	.34
July 6-July 16	Raking	1	W-3		8′ side delivery rake	28.3	.32	.32
July 10-July 20	Baling			Contract				
July 10-July 20	Roadsiding			Contract				
July 12-Aug.5	Irrigating (3 times) (11.1 acre-in.)						.93	
Aug.5-Aug.15	Fifth cutting	1	W-3		7′ power mower	26.7	.34	.34
Aug.6-Aug.16	Raking	1	W-3		8′ side delivery rake	28.3	.32	.32
Aug.10-Aug.20	Baling			Contract				
Aug.10-Aug.20	Roadsiding			Contract				
Aug.12-Sept.5	Irrigating (3 times) (11.1 acre-in.)						.93	

Continued-

Appendix Table 19 continued

Dates	Operations	Crew and Equipment				Acres per 9-hour day	Physical requirements	
		Men	Tractor	Truck	Equipment		Man-hours	Tractor hours
Sept.5-Sept.15	Sixth cutting	1	W-3		7' power mower	26.7	.34	.34
Sept.6-Sept.16	Raking	1	W-3		8' side delivery rake	28.3	.32	.32
Sept.10-Sept.20	Baling			Contract				
Sept.10-Sept.20	Roadsiding			Contract				
Sept.12-Oct.5	Irrigating (2 times) (7.4 acre-in.)						.62	
Oct.5-Oct.15	Seventh cutting	1	W-3		7' power mower	26.7	.34	.34
Oct.6-Oct.16	Raking	1	W-3		8' side delivery rake	28.3	.32	.32
Oct.10-Oct.20	Baling			Contract				
Oct.10-Oct.20	Roadsiding			Contract				
Oct.12-Oct.30	Irrigating (3.7 acre-in.)						.62	
TOTALS							10.32	4.62

APPENDIX TABLE 20

Standard of Inputs and Outputs and Calendar of Operations for Milo
(Per Acre Inputs Based on a Yield of 2 Tons and Typical of an 80-Acre Farm Unit)

Dates	Operations	Crew and Equipment				Acres per 9-hour day	Physical requirements	
		Men	Tractor	Truck	Equipment		Man-hours	Tractor hours
May 15-June 15	Disking (2 times)	1	W-3		7' offset disk	18.5	1.0	1.0
May 22-June 22	Furrowing out	1	W-3		4-row lister	28.9	.3	.3
May 24-June 24	Preirrigating (6 acre-in.)						1.6	
May 30-June 30	Disking and cultipacking	1	W-3		7' offset disk, 10' cultipacker	18.0	.5	.5
June 1-July 1	Planting (7.5 lbs.seed)	1	W-3		4-row lister planter	30.0	.3	.3
June 15-July 15	Irrigating (5 acre-in.)						1.7	
June 20-July 20	Cultivating	1	W-3		2-row cultivator	13.3	.7	.7
June 28-July 28	Cultivating and furrowing out	1	W-3		2-row cultivator	14.0	.6	.6
June 30-July 30	Irrigating (4 acre-in.)						1.3	
July 5-Aug.5	Cultivating and furrowing out	1	W-3		2-row cultivator	14.0	.6	.6
July 10-July 15 to Aug.30-Sept.5	Irrigating, continuous (12.6 acre-in.)						4.2	
Oct.15-Nov.15	Harvesting			Contract				
Oct.15-Nov.15	Hauling			Contract				
TOTALS							12.8	4.0

APPENDIX XXXIV

(For Acme Adapter Assembly to Valve, see Page 5 and Adapter to Gauge, see Page [illegible])

APPENDIX TABLE 21

Rates of Pay for Various Tasks Performed in the Northern Kern County Study Area, 1949-50

Task	Usual Basis of Payment	Rate per Unit
Tractor Driving	Hour	$ 1.00
Irrigating	Hour	.80
General Farm Labor	Hour	.80
Weeding	Hour	.75
Chopping Cotton	Hour	.75
Picking Cotton	Cwt.of Seed Cotton	3.25
Cutting Potato Seed	Cwt.	.25
Picking Potatoes	Cwt.	.14
Thinning Sugar Beets	Hour	.75
Beet Digger Operating	Hour	1.00
Pulling, Topping, Sacking Onions	Cwt.	.35

Source of data: (1) Field Interview Data

(2) Labor Contractors

APPENDIX TABLE 22

Charges for Contracted Operations in the Northern Kern County Study Area, 1950

Enterprise and Operation	Basis of Charge	Charge per Unit
Alfalfa:		
Baling	Ton	$ 3.65
Roadsiding	Ton	1.20
Barley:		
Harvesting	Acre	5.00
Hauling	Cwt. b/	.09
Beans:		
Harvesting	Cwt.	.75
Hauling	Cwt. b/	.075
Cleaning	Cwt.	.10
Castor Beans:		
Combining and Hauling	Lb.	.01
Hauling	Ton b/	6.50
Cotton:		
Dusting	Lb.	.04
Defoliating	Acre a/	4.00
Ginning	Bale d/	12.79
Field Corn:		
Picking and Hauling	Acre	10.00
Shelling	Acre	3.00
Milo:		
Harvesting	Ton	5.00
Hauling	Ton b/	2.00

Continued-

Appendix Table 22 continued

Enterprise and Operation	Basis of Charge	Charge per Unit
Onions:		
Spraying	Gal.	$ .05
Dusting	Lb.	.04
Hauling	Ton b/	2.50
Potatoes:		
Dusting	Lb.	.04
Rotobeating	Acre	3.00
Digging	Acre	10.00
Hauling	Cwt. b/	.10
Shed Costs (Washing,Grading, Sacking,Loading)	Cwt.	.50
Safflower:		
Harvesting	Ton	6.00
Hauling	Ton b/	4.25
Rental on Planting Equipment	Acre	.35
Sugar Beets:		
Rental on DT-4 Tractor	Hour	3.00
Rental on Beet Digger	Acre	10.00
Rental on Planting Equipment	Acre	.35
Hauling	Ton b/ c/	2.20

a/ Including materials.

b/ Based on average haul under present conditions.

c/ Net of company rebate.

d/ Including materials.

Source of data: (1) Field interview data.
(2) Job contractors.

APPENDIX TABLE 23

Costs of Materials Used in the
Northern Kern County Study Area, 1950

Materials	Unit	Cost per Unit
Seed:		
Alfalfa	Lb.	$ .25
Bean (Pink and Small White)	Lb.	.08
(Blackeye)	Lb.	.15
Barley (Treated)	Lb.	.035
Castor Bean	Lb.	.25
Cotton (Delinted)	Lb.	.06
Corn	Lb.	.24
Milo	Lb.	.08
Onion	Lb.	.08
Potato (Dipped)	Cwt.	5.00
Safflower	Lb.	.04125
Sugar Beet	Lb.	.45
Dusts and Sprays:		
5% DDT-50% Sulfur	Cwt.	5.50
5% DDT-75% Sulfur	Cwt.	5.75
10% DDT-50% Sulfur	Cwt.	9.14
Cotton Defoliant a/	Lb.	.37
Onion Oil Spray	Gal.	.12

Continued-

Appendix Table 23 continued

Materials	Unit	Cost per Unit
Fertilizers and Soil Conditioners:		
Quarry Gypsum	Ton	$ 3.00
Commercial Gypsum (Refined)	Ton	12.00
Lime-Sulfur (Liquid)	Gal.	.25
Sulfuric Acid	Ton	45.00
16-20 (Dry)	Ton	85.00
21% Ammonium Sulfate (Dry)	Ton	56.00
33 1/3% Ammonium Nitrate (Dry)	Ton	80.00
20% Ammonium Nitrate Solution	Gal.	.37
15-5-0 Liquid	Gal.	.67
10-10-0 Liquid	Gal.	.67
Aqua Ammonia 20%	Gal.	.30
Calcium Nitrate	Ton	60.00
Single Super Phosphate	Ton	27.00
NH_3	Lb.	.10
Fuel and Lubricants:		
Gasoline	Gal.	.208
Diesel Fuel	Gal.	.111
Stove Oil	Gal.	.126
Motor Oil	Gal.	.675
Grease	Lb.	.1325

a/ Usually included in charge for application.

APPENDIX TABLE 24

Electric Power Costs in the Northern Kern County Study Area, 1950

Size of Motor (Horsepower)	Service Charge per year	First 1000 Kilowatt Hrs.		Next 1000 Kilowatt Hrs.		Accumulation including Service Charge per year	Charge for over 2000 KWH per HP per year
		Charge per KWH per HP per year	Total per year	Charge per KWH per HP per year	Total per year		
30	$ 150.90	$ .0122	$ 366.00	$ .0074	$ 222.00	$ 738.90	$ .0053
40	201.20	.0122	488.00	.0074	296.00	985.20	.0053
50	225.00	.0111	555.00	.0074	370.00	1,150.00	.0048
75	337.50	.0111	832.50	.0074	555.00	1,725.00	.0048
100	397.00	.0111	1,110.00	.0074	740.00	2,247.00	.0048

Source of data: Pacific Gas and Electric Company Power Schedule P-3 Effective April 15, 1950.

APPENDIX TABLE 25

Overhead Costs in Operating Tractors of Typical Sizes
Found on 80- and 160-Acre Cotton and Potato Farms
in the Northern Kern County Study Area, 1950

Typical Tractors	First Cost	Salvage Value	Average Value	Expected Life (Years)	Overhead Costs per Year				Total Overhead Cost Per Year
					Depreciation	Interest	Taxes and Insurance	Shelter	
W-2	$1,485	$ 225	$ 855	8	$ 157.50	$42.75	$14.85	$1.50	$216.60
W-3	2,490	375	1,432	8	264.38	71.60	24.90	1.75	362.73
DT-3	2,990	450	1,720	8	317.50	86.00	29.90	2.00	435.40

Source of data: (1) Field interview data.

(2) Farm implement dealers.

APPENDIX TABLE 26

Overhead Costs in Operating Farm Implements
Typically Found on 80 and/or 160 Acre Cotton and Potato Farms
in the Northern Kern County Study Area, 1949

Typical Implements	First Cost	Salvage Value	Average Value	Expected Life (Years)	Overhead Costs Per Year			Total Overhead Cost Per Year
					Depreciation	Interest	Taxes and Insurance	
Borderer, 4-Disk	$ 95	$ 9.50	$ 52.25	12	$ 7.13	$ 2.61	$ .95	$ 10.69
Broadcast Seeder, Endgate	80	8.00	44.00	10	7.20	2.20	.80	10.20
Chisel, 8'	305	30.50	167.75	12	22.88	8.39	3.05	34.32
Cotton Trailer, 5 Bale	285	28.50	156.75	12	21.38	7.84	2.85	32.07
Cultipacker, 10'	210	21.00	115.50	10	18.90	4.62	2.10	25.62
Cultivators								
2-Row	180	18.00	99.00	12	15.17	4.95	1.80	21.92
4-Row	330	33.00	181.50	12	24.75	9.08	3.30	37.13
Ditcher, 5' V	135	13.50	74.25	12	10.12	3.71	1.35	15.18
Drag Float, 8' x 30' Shop Made	50	5.00	27.50	12	3.75	1.38	.50	5.63
Fertilizer Attachments								
2-Row	75	7.50	41.25	10	6.75	2.06	.75	9.56
4-Row	125	12.50	68.75	10	11.75	3.44	1.25	16.44
Harrows, Disk								
7' Offset	341	34.10	187.55	12	25.58	9.38	3.41	38.37
7 1/2' Offset	385	38.50	211.75	12	28.88	10.59	3.85	43.32
10' Offset	525	52.50	288.75	12	39.38	14.44	5.25	59.07

Continued-

Appendix Table 26 continued

Typical Implements	First Cost	Salvage Value	Average Value	Expected Life (Years)	Overhead Costs Per Year			Total Overhead Cost Per Year
					Depreciation	Interest	Taxes and Insurance	
Harrow, Spike 3-4' Sections	$ 60	$ 6.00	$ 33.00	12	$ 4.50	$ 1.65	$ .60	$ 6.75
Listers								
2-Row	170	17.00	93.50	12	12.75	4.68	1.70	19.13
4-Row	315	31.50	173.25	12	23.63	8.66	3.15	35.44
Lister Planter 4-Row	405	40.50	222.75	10	36.45	11.14	4.05	51.64
Mower Attachment 7' Trailer Type	180	18.00	99.00	10	16.20	4.95	1.80	22.95
Plow, 2-16" 2-way	325	32.50	178.75	12	24.38	8.94	3.25	36.57
Potato Planter, 2-Row (including fertilizer attachment)	570	57.00	313.50	10	51.30	15.68	5.70	72.68
Rake, 8' Side Delivery	315	31.50	173.25	10	28.35	8.66	3.15	40.16
Roller, 6' Steel	115	11.50	63.25	12	8.62	3.16	1.15	12.93
Scraper, 8'	265	26.50	145.75	12	19.88	7.29	2.65	29.82
Stalk Cutter, 2-Row	95	9.50	52.25	10	8.65	2.61	.95	12.21

Source of data: Interview data.

APPENDIX TABLE 27

Overhead Costs in Operating Farm Pumping Plants
Typically Found on 80- and/or 160 Acre Cotton and Potato Farms in the
Northern Kern County Study Area, 1949

Typical Well and Pump	First Cost	Salvage Value	Average Value	Expected Life (Years)	Overhead Costs Per Year			Total Overhead Cost Per Year
					Depreciation	Interest	Taxes and Insurance	
#1 900 G.P.M. 550' Drilled gravel envelope with 50 HP electric motor on pump with bowls at 225'								
Well	$1,720	$ --	$ 860	20	$ 86.00	$ 34.40		
Casing	1,250	--	625	20	62.50	25.00		
Motor	900	90	495	20	40.50	19.80		
Pump Assembly	3,145	--	1,572	20	157.25	62.88		
TOTAL	$7,015	$ 90	$3,552	20	$346.25	$142.08	$ 90.00	$578.33
#2 700 G.P.M. 400' Drilled with 30 HP electric motor on pump with bowls at 200'								
Well	$1,015	$ --	$ 508	20	$ 50.75	$ 20.32		
Casing	940	--	470	20	47.00	18.80		
Motor	655	66	360	20	29.45	14.40		
Pump Assembly	1,990	--	995	20	99.50	39.80		
TOTAL	$4,600	$ 66	$2,333	20	$226.70	$ 93.32	$ 65.00	$385.02

Source of data: Field Interview data.

Source of data: Field Interview data.

Typical Well and Pump	Cost	Salvage	Annual	Annual (Years) Life	Percent- age Interest	Insurance	Taxes and Maintenance	Total Overhead Cost Per Year
1% 600 G.P.M. 250' Drilled Vertical Turbine with 50 HP electric motor on pump with pole at 255'.								
Well	$1,250	# ---	# 800	50	# 80.00	# 31.40		
Casing	1,250	---	852	50	25.20	52.00		
Motor	600	20	452	50	40.20	49.80		
Pump Assembly	3,145	---	1,252	50	124.25	85.38		
TOTAL	$7,025	# 20	$3,252	50	$284.25	$314.80	# 90.00	$688.33
5% 700 G.P.M. 400' Drilled with 30 HP electric motor on pump with pole at 350'.								
Well	$7,015	# ---	# 808	50	# 80.00	$ 31.40		
Casing	1,250	---	852	50	25.20	52.00		
Motor	550	20	452	50	40.20	49.80		
Pump Assembly	1,995	---	552	50	69.25	36.80		
TOTAL	$10,805	# 20	$2,252	50	$214.25	$214.80	# 90.00	$518.05

APPENDIX TABLE VI

Overhead Costs in Operating Farm Tubular Irrigate

Typical well on 80- mule foot Delo Pace Cotton and Potato farms in the

Montezuma Farm Company Ordway Area, 1958

Typical Well and Pump	Cost	Salvage	Annual	Annual (Years) Life	Percent- age Interest	Insurance	Taxes and Maintenance	Total Overhead Cost Per Year
1% 600 G.P.M. 250' Drilled Vertical turbine with 50 HP electric motor on pump with pole at 255'.								
Well	$7,250	# ---	# 800	50	# 80.00	# 31.40		
Casing	1,250	---	852	50	25.20	52.00		
Motor	600	20	452	50	40.20	49.80		
Pump Assembly	3,145	---	1,252	50	124.25	85.38		
TOTAL	$12,245	# 20	$3,252	50	$284.25	$314.80	# 90.00	$688.33
5% 700 G.P.M. 400' Drilled with 30 HP electric motor on pump with pole at 350'.								
Well	$7,015	# ---	# 808	50	# 80.00	$ 31.40		
Casing	1,250	---	852	50	25.20	52.00		
Motor	550	20	452	50	40.20	49.80		
Pump Assembly	1,995	---	552	50	69.25	36.80		
TOTAL	$10,805	# 20	$2,252	50	$214.25	$214.80	# 90.00	$518.05

APPENDIX TABLE 28

Overhead Costs in Operating Underground Irrigation Systems
Typical of 80- and 160-Acre Cotton and Potato Farms
in the Northern Kern County Study Area, 1949

Typical Physical Systems	First Cost	Average Value	Expected Life (Years)	Overhead Costs Per Year			Total Overhead Cost Per Year
				Depreciation	Interest	Taxes and Insurance	
80 Acre Unit							
Concrete Pipe (4130'- 14" and 12")	$2,694.00	$1,347.00	30	$ 89.80	$ 53.88		
Standpipes (3 - 36" x 72")	88.00	44.00	30	2.93	1.76		
Breathers (5-4" Steel)	17.00	8.50	30	.57	.34		
Valves and Cates (40)	665.00	332.50	30	22.17	13.30		
Cap Stands (1)	25.00	12.50	30	.83	.50		
TOTAL	$3,489.00	$1,744.50	30	$116.30	$ 69.78	$ 45.00	$ 231.08
160 Acre Unit							
Concrete Pipe (7730'- 16",14", and 12")	$5,332.00	$2,666.00	30	$177.73	$106.64		
Standpipes (4-36" x 72")	117.00	58.50	30	3.90	2.34		
Breathers (9 Steel)	32.00	16.00	30	1.07	.64		
Valves and Gates (80)	1,591.00	795.50	30	53.03	31.82		
Cap Stands (2)	50.00	25.00	30	1.67	1.00		
TOTAL	$7,122.00	$3,561.00	30	$237.40	$142.44	$ 75.00	$ 454.84

Source of data: Field Interview data.

Source of data: Field Interview data.

Item	Total Cost	Overhead Cost	Taxes and Insurance	Interest	Depreciation	Life (Years)	Variable Cost	Total Fixed Cost
80 Acre Unit								
Concrete Pipe (10"-30" & 42" dia.)	$3,094.00	$1,341.00		4.68	30		1.47	88.00
Structures (3 - 48" dia. x 45' long)	88.00	44.00		5.63	30		.44	44.00
Structures (2-48" dia. x 30' long)	71.00	43.80		.72	30		.44	27.20
Levees and Dykes (40)	888.00	344.00		11.55	30		4.30	544.00
Gen. Grange (1)	25.00	15.00		.63	30		.20	10.00
TOTAL	$3,186.00	$1,444.00		22.61	30		6.85	742.00
160 Acre Unit								
Concrete Pipe (10"-30" & 42" dia.)	$5,556.00	$2,444,444.00		17.13	30		5.34	312.00
Structures (4-48" dia. x 30' long, 2-48" dia. x 45' long and 45' long)	111.00	82.50		6.4	30		1.44	29.00
Transformers (2 Sets)	35.00	16.00		1.04	30		.44	19.00
Levees and Dykes (40)	1,152.00	592.50		23.04	30		7.35	560.00
Gen. Grange (1)	20.00	15.00		1.1	30		1.00	5.00
TOTAL	$1,324.00	$2,444,607.00		48.654	30		15.13	925.00

APPENDIX TABLE 28

Overhead Costs in Operating Hydrostatic Irrigation Systems
for Type of 80- and 160-Acre Cotton and Potato Farms
in the Northern Kern County Study Area, 1954